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ABSTRACT

A three-year research and development project investigated sex bias in classroom interactions and developed training strategies to reduce or eliminate them. Two training interventions were taught to two groups of selected fourth, sixth, and eighth grade teachers. One was based on a microteaching model and applied in 44 classrooms in Washington, D.C., while the other, based on a collegial problem solving model, was applied in 24 classrooms in New England. A comparable group of 34 teachers comprised the control group. All classrooms were observed by raters trained in the INTERSECT Observation System. The study's findings emerged in three broad categories: (1) general characteristics of classroom interaction; (2) bias as reflected in classroom interaction; and (3) treatment and control differences. Findings indicated that boys participated in more interactions than their representation in the class would indicate; the reverse was true of girls. Boys received more praise, acceptance, remediation, criticism, and conduct interaction than girls. Approximately half of the typical (control) classes were characterized by sex segregated seating and grouping patterns. Teachers in the two training interventions were less biased in their teaching patterns than teachers in the control group. Of the two interventions, the microteaching was seen as the most equitable. Numerous tables are included. (Author/JD)

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Year 3: FINAL REPORT

PROMOTING EFFECTIVENESS IN CLASSROOM INSTRUCTION

March, 1984

Contract No. 400-80-0033

The NETWORK
Andover, Massachusetts

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Year 3: FINAL REPORT

PROMOTING EFFECTIVENESS IN CLASSROOM INSTRUCTION

March, 1984

Contract No. 400-80-0033

Project Directors:

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David and Myra Sadker
Project Directors

ABSTRACT

While the literature is not conclusive, the preponderance of research has suggested that sex differential treatment of students characterizes the classroom interaction process. A number of studies have indicated that male students receive more teacher attention in terms of both praise and criticism. This three year research and development project investigated sex equity in classroom interactions and developed training strategies to reduce or eliminate sex bias interactions in the natural classroom setting.

Two training interventions were developed to prepare teachers for more equitable instructional behavior. In the Washington, D.C. metropolitan area, teachers from 44 fourth, sixth, and eigth grade classrooms were trained through an intervention based on a microteaching model. In New England, teachers from 24 fourth, sixth, and eighth grade classrooms participated in a training invervention based on a collegial problem solving model. A comparable group of teachers from 34 fourth, sixth, and eighth grade classrooms comprised the control population. The sample represented urban, suburban, and rural areas as well as predominantly majority, minority, and intergrated classrooms. Approximately half the classrooms focused on language arts and reading content while the other half dealt with mathematics and science. Thirty-five teachers were black, 66 were white, and one was Hispanic. Thirty of these classrooms were taught by males and seventy-two by females. All classrooms were observed by three 45-minute periods by raters trained in the INTERSECT Observation System.

Data gathered from these observations were analyzed using a variety of statistical procedures. In the first approach, the distribution, frequency, and nature of the teacher-student interaction was aggregated across classrooms within each of the two treatment and the control conditions. The three conditions were compared for their relative degrees of sex bias and equity through the development of a new concept, the coefficient of distribution which compard expected with actual interaction patterns. In the second approach, the individual classroom was considered the unit of analysis. Significance tests were conducted to determine if each class had teacher-student interaction patterns which significantly favored boys, girls, or neither. The distribution of these three types of classrooms was tallied across all three conditions. For selected interaction data, additional analyses were performed. A three way multivariate analysis (treatment x subject x grade) compared the frequency and distribution of several critical interaction areas. In addition, limited ethnography data and data on minority interaction patterns were also collected and analyzed.

The study's findings emerged in three broad categories: (1) general characteristics of classroom interaction; (2) bias as reflected in classroom interaction; (3) treatment and control differences. Although too numerous to be summarized in an abstract, several sample findings indicate the nature of study results. The majority of teacher responses to student comments were categorized as vague, general, non-evaluative -- simple acceptance responses. In approximately 25 percent of the typical (control) classrooms, teachers never praised students. In approximately 40 percent of the control classrooms

teachers never criticized a student response. In almost half of all classrooms, one, two, or three students were involved in 20 percent of all interactions. Approximately 25 percent of all students did not participate in classroom interaction. The typical classroom was characterized by these interactive-rich and interactive-poor students.

Boys participated in more interactions than their representation in the class would lead one to expect. The reverse was true for girls. This inequitable distribution of teacher interaction increased as the year progressed. Boys received more praise, acceptance, remediation, criticism, and conduct interactions than girls. As boys called out more in class, they received more intellectual interactions with the teacher. As girls called out more in class, the teacher was more likely to respond with conduct remediation responses. Approximately half of the typical (control) classes observed were characterized [illegible] sex segregated seating and grouping patterns.

Of the three conditions, the microteaching intervention was the most equitable, reaching statistical significance in several different interaction categories. In general, teachers in the two training interventions were less biased in their interaction patterns than teachers in the control conditions. By the third observation, in 40 percent of the typical or control classes, teachers were participating in more interaction with boys than with girls. Teachers praised students more frequently and were involved in more intellectual interaction at a statistically significant level in the microteaching classes than in the problem solving or control conditions.

The study's findings underscore sex differential treatments in classroom interaction patterns, as well as the effectiveness of training in overcoming this bias. The study also revealed general characteristics of interaction and indicated several directions for future research.

I. PROJECT OVERVIEW AND LITERATURE REVIEW

In our proposal submitted to the National Institute of Education in response to RFP-NIE-R-80-0018, we proposed "to design, implement, evaluate, and disseminate a set of intervention strategies which when implemented would produce more equitable classrooms." As stated in this proposal, our major goals were "to develop successful techniques for changing sex-biased interaction in the natural classroom setting" and "to develop new knowledge about sex equity in classroom interactions." This final report details the results of our work, Project INTERSECT, in attaining major project goals. In this report, we summarize project activities to date including development and implementation of interventions, construction of observation systems and rater training, selection of sample and research methodology, the results of our analyses, and our finding and major conclusions.

A. Philosophical Perspective

Certain philosophical principles underlie this research project. The researchers feel that this perspective must be clearly delineated to assist the reader in interpreting methodology and findings.

The context for this research project is the well-documented body of literature conducted over the past decades indicating that active student participation in classroom discussions leads to higher student achievement and more positive student attitude toward the learning process. During classroom interaction, the teacher acts as a "gatekeeper" to student participation in these discussions. By calling on students, teachers allow them the opportunity to express their ideas, thoughts, feelings, confusions and difficulties. By asking students questions, teachers give them the opportunity to explain, clarify, and refine information and ideas. By praising, remediating, and even, as appropriate, criticizing, teachers give students the necessary feedback that enables them to correct erroneous information and to master new academic skills. In short, teacher attention is a vital resource which, along with the broad range of instructional materials, is essential for academic progress. It is important that all students have access to this resource.

In many classrooms, certain students appear to receive more than their "fair share" of this important resource, teacher attention. Those students who are very assertive are more likely to gain teacher attention than are the shy members of the classroom. In other cases, students who are more advanced academically may gain greater access to this resource. To continue the gate-keeping metaphor, some students come to the classroom with the skills and abilities that function as electric door-openers, while other students seem unable to find the key that will allow them adequate access to the interaction process.

Ironically, the classroom interaction process is so rapid that the typical teacher, engaged in over 1,000 exchanges each day, may be unaware of the nature and degree of disparities in access. And, as an extensive body of research indicates, this may result in disparities in academic achievement. Consequently, training is necessary to make teachers aware of this problem and provide them with the skills that will allow students to receive their fair share of teacher attention.

Since teacher attention is a valuable resource for encouraging learning for all students, this attention should be distributed on an equitable basis regardless of student race, sex, national origin or ability level. No student should receive less than his or her fair share of the teacher's attention; nor should any group or class of students receive significantly less attention than their representation in the classroom population warrants. In some cases, situations may emerge in which an individual student or group of students needs additional instruction. When this occurs, compensatory help should be provided in a manner that does not deny the remainder of the students in the class access to the interaction process and to their fair share of teacher attention.

Our experience in classroom observation, intervention and training for project INTERSECT over the past years has led us to conclude that it is very difficult for one teacher to provide this compensatory help during regular classroom time. Teachers are actively and intensely involved in ongoing interaction with students; the necessity of giving additional time and attention to students in need may jeopardize the fair and equitable distribution of attention to all students. Consequently, the provision of additional resources becomes necessary. These additional resources could include but not be limited to the following: the use of teacher aides; instructional technology; the provision of extended classroom time; or additional teacher time expended outside the regular classroom.

The teacher represents the crucial classroom learning resource, and all students should have their fair share of access to that resource. Teachers who consistently provide greater time and attention to a select group of students, do so at the expense of other students, and deny these students an equal access to educational opportunities. Students who require or demand additional educational resources should be provided those resources, but not at the expense of the learning time and attention of their classmates.

B. The Treatment of Male and Female Students Within the Classroom Interaction Process: A Research Review

Analyzing the causes of sex differential patterns of interaction in classrooms is extraordinarily complex. Since students spend a significant portion of their time inside classrooms, it is important to examine how students are treated in this context. At this point it is not possible to draw direct cause and effect links between teacher behavior and student outcomes. Nevertheless, it is critical to examine the nature of classroom interaction and to explore its potential as a major socialization force.

A review of the literature and analysis of research findings indicates that the following areas are central to the persistence of inequity:

1) Active Teaching Attention
2) Evaluation of Academic Work within the Classroom Interaction Process
3) Classroom Management
4) Peer Influence and Sex Segregation
5) Sex Bias in the Content of Language

Following is a review of the literature on these aspects of classroom interaction and the treatment of male and female students within this context. Finally, there is a literature review concerning sex differential patterns in verbal and non-verbal adult communication styles.

B.1 Active Teaching Attention

Recent research on teacher effectiveness indicates that direct instruction appears to be very important in increasing student achievement. Direct instruction involves active teaching; it includes the setting of goals, assessing student progress, making active and clear presentations of the concepts under study; giving clear instruction both for class and individual work (Good, 1979). While the literature is not conclusive in this area, it appears that sex differences in active teaching attention may characterize the interaction process.

In one large study involving 24 fourth and sixth grade classes, teachers interacted more with boys on four major categories: disapproval, approval, instruction, and listening to the child (Spaulding, 1963). Several other researchers have also found that boys receive both more criticism and more praise (Felsenthal, 1970; Wirtenberg, 1979).

A recent study of reading and math instruction in second grade classrooms revealed that teachers made more academic contacts with girls in reading and with boys in math; teachers spent relatively more cognitive time with girls in reading and with boys in math. Although there were no differences in initial abilities, sex differences were found in end-of-year achievement in reading (Leinhardt, Seewald, & Engel, 1979).

A study at the junior high school level showed that boys received more academic contacts and they were asked more complex and abstract questions (Sikes, 1971).

A study at the secondary school level found striking differences in favor of boys. Boys were asked more direct questions and more open-ended questions; they received more teacher initiated work contacts and more total positive teacher-student contacts (Jones, 1971).

A study of 105 gifted students revealed that teachers initiated more talk with boys, discriminated significantly between boys and girls in favor of boys and were more restrictive toward girls (Casper, 1970).

Research at the preschool level showed that teachers gave attention over 1.5 times more frequently to boys than girls who were participating in classroom activities. They praised boys more frequently and were 2.5 times as likely to engage in extended conversation with them. Further, teachers were twice as likely to give male students extended directions, and detailed instruction on how to do things "for oneself." In contrast, they were less likely to explain things to girls. They tended to "do it for them" instead. The researchers, Serbin and O'Leary (1975), give a graphic description of how this pattern operated:

> In one classroom, the children were making party baskets. When the time came to staple the paper handles in place, the teacher worked with each child individually. She showed the boys how to use the stapler by holding the handle in place while the child stapled it. On the girls' turns, however, if the child didn't spontaneously staple the handle herself, the teacher took the basket, stapled it, and handed it back to her.

In her study of sex desegregation at the Coast Guard Academy, Safilios Rothschild (1979) found that instructors are more likely to give males detailed instructions in how to accomplish tasks; in contrast they are more likely to do tasks for female students.

It is important to note that it is mainly high achieving boys who receive more teacher approval and active instruction, while low achieving boys are likely to receive more teacher criticism. In fact, Brophy and Good (1974) have concluded, "In many ways, insofar as teacher-student interaction is concerned, it makes sense to speak of low achieving boys and high achieving boys as separate groups rather than to speak of boys as a single group." Parsons (1979) has found that while high achieving boys receive the most praise, high achieving girls receive less praise than low achieving girls, and less than both low and high achieving boys.

Minority group students also receive less teacher praise and active instruction. Rubovits and Maehr (1973) found that teachers gave less attention to black students; they requested fewer statements from them, ignored a greater percentage of their statements, expanded on their ideas less frequently, praised them less and criticized them more. Other studies show similar patterns of criticism for Mexican-American and native-American children (Brophy & Good, 1974).

B.2 Evaluation of Academic Work Within the Classroom Interaction Context

Dweck has found that there are sex differences in a pattern of behavior called "learned helplessness." Learned helplessness exists where failure is perceived as insurmountable. Children who exhibit learned helplessness attribute failure to factors that they cannot control, for example, lack of ability. After receiving negative evaluation, children characterized by learned helplessness are likely to show further deterioration in performance. In contrast, children who emphasize factors that can be modified or changed, such as effort, for example, tend to see failure as surmountable. After negative evaluation, these children often will show improved performance.

Girls are more likely than boys to exhibit learned helplessness. They are more likely to blame poor performance on a lack of ability rather than a lack of effort. They are also "more prone than boys to show decreased persistence or impaired performance following failure, the threat of failure or increased evaluative pressure." (Dweck, Davidson, Nelson, & Enna, 1978).

While the research is far from conclusive, some studies suggest that teachers' evaluative feedback regarding the intellectual quality of academic work may be a factor in causing sex differences in learned helplessness. In observing 4th and 5th grade classrooms, Dweck and her colleagues (1978) found that approximately 90 percent of the praise boys received for their academic work was directed at intellectual competence. In contrast for girls, significantly less of their work-related praise, -- approximately 80 percent -- was for intellectual competence. The other 20 percent of the praise girls received for their work was directed at papers following the rules of form. In terms of work-related criticism, the sex differences are even more striking. Approximately half of the work-related criticism boys received was for intellectual inadequacy. The remaining work-related criticism was for failure to obey the rules of form. In contrast, almost 90 percent of work-related criticism girls received was specifically directed at intellectual inadequacy. Girls received little criticism pertaining to violation of the rules of form. A similar pattern emerged from a study by Spaulding (1963) involving twenty-one fourth and sixth grade classes: the boys received more total blame and disapproval, but this criticism was largely for inappropriate conduct. In the areas of disapproval for lack of knowledge or skill, girls received almost twice as much teacher disapproval as did boys.

As Dweck and her colleagues analyzed differences in the ways teachers criticized the academic work of girls and boys, they discovered another very important pattern. When teachers criticized boys, they tended to attribute their academic inadequacies to lack of effort. However, when teachers criticized girls, they seldom attributed intellectual inadequacy to lack of effort.

To determine whether these differential evaluation patterns were related to sex differences in learned helplessness, Dweck and her colleagues conducted the following experiment with 60 fifth grade children (1978). Ten boys and ten girls were randomly assigned to each of three experimental conditions. In one experimental condition, ten boys and ten girls were taken individually to a testing room where they were presented with word puzzles. The children were given two kinds of failure feedback on their performance. One kind of feedback was specifically addressed to the correctness of the solution. The other kind of failure feedback was explicitly addressed to a non-intellectual aspect of the performance. This was called the "teacher-boy condition" because is approximated the kind of negative evaluation that boys are more likely to receive in classrooms. Each of the other two experimental conditions consisted of ten boys and ten girls. In these conditions the children also worked individually in a testing room on word puzzles. However, the failure feedback these children received was addressed specifically to the correctness of the solution. These children did *not* receive failure feedback addressed to a non-intellectual aspect of their performance, such as neatness. These were called the "teacher-girl conditions" because they approximated the kind of negative evaluation girls are more likely to receive in classrooms.

At the end of the word puzzle trials, the children in all three conditions were given written questions that assessed whether they attributed failure to the instructor's unfairness, to their own lack of effort, or to their own lack of ability. Most of the children in the "teacher-boy condition" did not view failure on the word puzzles as reflecting a lack of ability. Both boys *and* girls in this condition indicated that insufficient effort was the cause of failure. In sharp contrast, both girls *and* boys in the two "teacher-girl conditions" overwhelmingly interpreted the failure feedback as indicating lack of ability. This research led the experimenters to conclude that "the pattern of evaluative feedback given to boys and girls in the classroom can result directly in girl's greater tendency to view failure feedback as indicative of their level of ability."

B.3 Classroom Management

Several studies indicate that male students receive more teacher disapproval contacts directed at classroom misbehavior, and that boys are reprimanded more harshly as well as more often (Jackson & Lahaderne, 1967; Meyer & Thompson, 1963; Lippit & Gold, 1959). A possible explanation of sex differential patterns of classroom management is that socialization patterns cause boys to misbehave more in schools and, consequently, males are deserving of negative teacher attention. However, one study of 15 preschool classrooms showed that when teachers were faced with disruptive behavior, particularly aggressive behavior from both boys and girls, the teachers were over three times as likely to reprimand the boys as the girls.

Further, they more frequently punished the boys through a loud and public reprimand. When they did reprimand girls they did it quickly and quietly in a way that other members of the classroom could not hear (Serbin, O'Leary, Kent, Tonick, 1973). So even when both girls and boys are exhibiting inappropriate behavior, boys are reprimanded more frequently and more harshly. Several other studies at different grade levels indicate that when girls and boys have participated equally in classroom misconduct, boys are reprimanded more loudly and are given harsher penalties. Low achieving boys are most likely to receive this negative teacher attention (Brophy & Good, 1974).

While it is difficult to draw direct cause and effect links between teacher behavior and student outcomes, it is pertinent and intriguing to speculate about potential outcomes. Clearly, the frequent, intense public reprimand is a disciplinary approach at odds with the major themes of research concerning effective classroom management (Weber, 1977). It is even possible that the methods teachers frequently use for disciplining boys are more likely to intensify inappropriate behavior rather than to terminate it.

It is interesting that the patterns that emerge from the observational literature are also reflected in comments teachers make about students in interviews. Content analysis of these comments indicate far more personal involvement with male than with female students. Boys also received more negative comments, mostly in the areas of sloppy work, not trying hard enough, and classroom misbehavior (Jackson, Silberman & Wolfson, 1969).

B.4 Peer Influence and Sex Segregation

Children learn early to value the opinions of their peer group (Campbell, 1964). The importance placed on this opinion increases as children mature, resulting in a high degree of conformity during the pre-adolescent and adolescent years. In his classic study of students in ten urban and ten rural high schools, Coleman (1960) found that students typically valued popularity more than academic success. This peer group pressure for social rather than academic success was shown to be especially potent and stressful for the adolescent female. Fox (1977) has found that the adolescent peer group can have a negative effect on female participation in math and science. Many young women in high school perceive strong peer pressure against enrolling in advanced math courses, and mathematically gifted females show reluctance to skip grades due to peer disapproval and rejection. Matthews and Tiedeman (1964) found that a decline in career commitment by high school females was related to their perceptions of male peers' disapproval of a woman using her intelligence.

Peer groups that are segregated by sex characterize the elementary school years. Sometimes teachers create this segregation by categorizng students on the basis of gender; they may form separate boy and girl lines, teams for contests, and groups for various classroom tasks and assignments. (Frazier & Sadker, 1973). Teachers may also influence peer groups and sex segregation by assigning more leadership roles in the classroom to male students (Lockheed, 1978). However, even when this teacher interference does not occur, children tend to self select into same sex peer groups. Clement and Eisenhart (1979) found that ten-to-twelve year olds sorted themselves into gender-segregated groups whenever the opportunity arose. Within these sex segregated groups, different values and roles were emphasized for boys and for girls. Girls' groups stressed the importance of being "popular," "cute," and "sweet." Boys' groups placed higher value on being "strong," a "good student," and a "good basketball player."

Several other researchers note that same sex interactions are more common than cross sex interactions among elementary school children; children are more likely to cross racial lines than sex lines in classroom interaction (Bossert, 1979; Devries & Edwards, 1977; Willia and Recker, 19[illegible]). Grant (1982) conducted ethnographic oibservations of urban first grade classrooms and found that girls often fulfilled a caretaker or helping role for boys (helping with academic work, tying shoes). Boys were far less likely to demonstrate these behaviors for girls. In contrast girls received more hostile remarks in cross sex interaction and were more likely to be the "victims of criticism, racist and sexist remarks, and physical and verbal aggression," (Grant, 1982).

A variety of negative outcomes may result from this sex segregated peer grouping. Girls and boys who interact primarily in sex-segregated groups may have limited opportunities to learn about and engage in the interests and activities of the other gender group. Further sex segregared grouping may make it more difficult for teachers to interact equitably with male and female students in classrooms. Moreover, this sex segregation may create barriers to females and males working cooperatively together, not only during school, but potentially during the adult years as well.

While there have been many reports that teacher behavior may increase sex segregation, there is, at this point, limited research concerning interaction patterns teachers may use to encourage cooperative cross-sex work and play. However, Serbin and her colleagues (1977) found that cooperative cross-sex play in a pre-school setting can be increased through the use of contingent teacher attention. Teacher praise of cooperative cross-sex play produced a clear increase in this type of student behavior. It is important to note that this increase was generally achieved without a reduction in same sex or solitary play. An expansion of the children's range of playmates took place rather than a change from one set of playmates to another. It appears that this study at the pre-school level has implications for intervention at the upper elementary grades.

Finally, Lockheed and Harris (1982) in research in 29 fourth and fifth grade classrooms found that students often do not appear willing to work on science projects with cross-sex classmates. However, student held significantly less stereotyped attitudes in classrooms where there was more opportunity for peer collaboration and interaction.

B.5 Sex Bias in the Content of Language

Several researchers have studied bias in the content of written language usage. A variety of findings have emerged. For example, there are ten times as many sexual terms applying to females as to males (Nilsen, 1972). Women are often compared to plants (clinging vine, shrinking violet) animals (biddy, chicken, pig), and foods (sweetie, honey, dish). There are, in general, far more negative terms for women than men.

Most of the research on sex bias in written language has focused on the potential impact of the use of supposed generics such as "he" and "man" to refer to all people. Studies indicate that elementary, secondary, and college students literally envision males, when these generics are used, even when the context implies both men and women (Eakins and Eakins, 1978). In a study by Schneider and Hacker (1973), students illustrated supposedly generic references to "urban man" with pictures of males; they were less likely to illustrate with male pictures when the references were neutral (e.g. "Urban Life"). Other researchers found that female students indicated that the job of psychologist was less attractive to them when it was described with make generic nouns and pronouns than when sexually neutral terms were used. Cole, Hill, & Dayley (1983) conducted six experiments to explore whether the pronoun "he," when used as a supposed generic, might increase the likelihood of people to think of male referents. They found no empirical evidence that the pronoun, he, gave rise to increased male imagery. They also found that the use of equalitarian pronouns (he or she; they), did not increase the likelihood of the subjects visualizing women. However, when the word, man, was used as a generic and linked with the pronoun, he, used generically, the responses of both men and women reflected more thoughts of men than when subjects were exposed to alternative pronoun, they, with man. Further, women who are exposed to the female generic (she to include everybody) reported feelings of pride, importance, and power (Brannon, 1978).

Far less research has been conducted on the use and impact of supposedly generic words in spoken communication, particularly classroom interaction. However, research by Richmond and Dyba (1978) conducted with 452 teachers from the elementary and secondary levels showed that sexist language was used frequently by these personnel. Further their research demonstrated that major changes in the behavior of teachers can be achieved in controlled situations so that teachers will use less sexist terminology and more nonsexist language.

B.6 Sex Differential Patterns in Verbal and Nonverbal Adult Communication Styles

While the focus of this research is concerned with issues of sex equity in classroom interaction, it is of interest to provide a broader context and explore sex differential patterns in adult communication styles. As has been noted, boys are more likely than girls to be active participants in verbal classroom interaction. Despite prevalent stereotypes, research on adult communication presents similar findings. Studies conducted in offices, in private homes, in hospitals, in group discussions, and in dyadic interactions show that men talk more than women (Eakins and Eakins, 1978) For example, in one experiment male and female subjects were asked to describe a series of pictures. For a man the average description time was 13 minutes. For a woman, the average time was three minutes (Swacker, 1975).

One of the mechanisms men use to dominate communications is the interruption. In cross-sex conversations, almost all interruptions are by male speakers. In their analysis of conversations in both on and off campus university settings, Zimmerman and West (1975) found that males interrupt females far more often than they interrupt other males and far more often than females interrupt either males or females.

It is interesting that while men exert more control in the course of conversations, women extend more effort in maintaining communication. Fishman analyzed over 50 hours of conversations that occurred in natural settings.

She found that 96 percent of the topics introduced by men were developed in conversations. Only 36 percent of the topics women introduced were developed in a similar manner. Women asked questions to help develop topics. In contrast, men were less likely to ask questions or to make extended comments to help in developing topics introduced by women.

Further research indicates that womens' language is often characterized by a more tentative conversational style. For example, women are more likely to use qualifiers, such as "I guess", excessively polite speech, "empty adjectives" such as "lovely", and to insert tag questions at the end of declarative statements (Lakoff, 1976). Many researchers indicate that this tentative language does not characterize womens' speech so much as it characterizes the speech of the powerless. For example, Crosby and Nyquist (1977) analyzed communication in a police station. They found that male and female clients who came to the station were more likely to use "women's language" than were either male or female police personnel.

Sex differential patterns in the nonverbal communication patterns of adults have also been explored. Nonverbal patterns are important in communication, carrying over four times the weight of verbal messages (Salter et. al., 1970). Women appear to communicate more effectively using this nonverbal channel. They are better than men at decoding nonverbal cues. They are also more likely to reflect their feelings through facial expressions (Eakins and Eakins, 1978). However, the nonverbal channel also reveals that adult females appear to communicate with less power and status than adult males. While women gaze at their partners often during communication, they are more likely to avert their eyes, particularly in a direct staring confontation with men.

Throughout their lives, women are more likely to be touched than are men. Many researchers consider this touching to be not so much a sexual overture or an indication of warmth and intimacy, as a nonverbal display of power (Eakins and Eakins, 1978). Lack of power and status is also reflected in the use of space. Womens' space is more likely to be intruded on by others. Women are approached more closely than men by both men and women (Sommer, 1969). When women and men approach each other on the street, women are more likely to move out of the way or walk around men (Silviera, 1972). Women are more likely to smile than men, even when they are not happy or amused. Some researchers claim that this frequent smile is really a badge of submission (Eakins and Eakins, 1978).

Little research on sex differences in nonverbal classroom interaction has been conducted. Given the rich body of literature on adult communication, it would appear that this might be a fruitful avenue for further research.

C. Accomplishments of INTERSECT: The First Two Years

Major efforts of the first two years of the INTERSECT project were developmental in nature. These focused on the construction of an observation instrument, survey instruments, and two interventions. Following is a summary of these accomplishments:

An initial literature review as well as an analysis of existing observation instruments indicated the need for construction of new instrumentation to focus specifically on sex equity and/or bias in the nature of teacher-student interaction. Consultation with Carol Dweck, who has conducted extensive research concerning classroom interaction as it involves female and male students, led to the development of the initial INTERSECT observation form. This system was field tested in over thirty-six classrooms, and numerous revisions were made based on field test results. Further modifications were made based on continued literatures review and communications with noted researchers in the field. Following this ongoing process of field testing and revision, a version of the INTERSECT observation system (instrument and manual) was submitted to the project's National Review Panel for analysis. All members of the review panel, including experts in the field of sex equity, analysis of classroom interaction, and ethnographic research, made extensive comments and these were incorporated in a further revision of the instrument and manual. The revised observation system was field tested in additional classrooms and on teacher training films that included classroom interaction. The final version of the INTERSECT observation system and its rater's manual are included in the appendices of this report.

The project also adapted existing instrumentation to design the three pre-post surveys used to access the impact of interventions on teachers and students.

These three survey instruments were as follows: 1) the Adjective Teacher Checklist; 2) the Student Survey; and 3) the Classroom Survey. The Adjective Teacher Checklist was administered to control and experimental teachers in a fall 1981 pretest and a winter 1982 posttest. The two student surveys were administered in control and experimental classrooms in the fall and winter as well. These administrations, in combination with classroom observations, constituted the INTERSECT data collection phase.

The project also developed two sets of intervention materials, as negotiated in the final contract agreements with the National Institute of Education. Both interventions trained teachers in four skills for sex equity in classroom interactions. These skills were identified as a result of extensive literature review and included:

1) Active Teaching Attention
2) Classroom Discipline
3) Verbal Evaluation of Academic Work
4) Classroom Integration on the Basis of Sex

The two interventions represented different training strategies. Myra and David Sadker developed Intervention I: Microteaching Training for Sex Equity in Classroom Interactions and trained teachers in the Washington-Baltimore areas. Leslie Hergert developed Intervention II: Interactive Problem-Solving for Sex Equity in the Classroom and trained teachers in the New England area. Leslie Hergert worked with Jo Jarvis, staff of a WEEA-funded Sex Equity Demonstration Project.

In the microteaching intervention, skills were identified in the four key areas for sex equity in classroom interactions. Teachers were presented with a visual model of the skills, read materials about the skills, and discussed them. Further, the intervention engaged teachers in practicing the four identified skills while receiving feedback on their performance. The problem-solving intervention provided initial training in the four skills and in curricular revision, then engaged teachers in diagnosing their classroom needs and in peer problem-solving. Following is more detailed information on the materials and training methodology used in the two interventions. Also, training materials for each of these interventions are included in the appendices of this report.

C.1 Intervention I: Microteaching Training for Sex Equity in Classroom Interactions

Microteaching training materials were developed for each of the four equity skills identified. Each of the four skill descriptions included: objectives, a rationale and research review, strategies for attaining the skill, references, and an assessment sheet to determine if skill mastery had been attained.

A perceptual and videotaped model was also developed for the microteaching training. This 28-minute color videotape offered background information on the nature and impact of sex bias in education. It also presented classroom scenes in which teachers first demonstrated biased behavior and then demonstrated equitable behavior in the four classroom interaction skills.

A microteaching supervisor was recruited and trained to supervise Intervention I teachers during academic year 1981-1982. The supervisor received extensive training by the project directors in both the theory of, and strategies for, effective supervision, and participated as a supervisor in the August training session.

Microteaching training for intervention teachers in the Washington and Baltimore areas was held at The American University on August 26, 27, and 28, 1981. Teachers were first presented with general information on sex bias in education as well as more specific information on sex bias in curriculum and in interaction patterns.

Following presentation of introductory materials, intervention teachers viewed the videotape on sex bias in classroom interaction and read the skill descriptions. As suggested by research on microteaching, there was thorough discussion of skill objectives and components before teachers attempted to demonstrate the skills.

After viewing, reading and discussing the skills, teachers attempted to demonstrate each of the sex equity skills in small group clinical settings. The project directors decided that peer teaching in this clinical situation would create an artificial environment. Consequently, fourth, sixth, and eighth grade students from local elementary and junior high schools participated as microteaching students in order to develop a more realistic clinical situation.

Clinical supervisors, identified and trained earlier, used assessment sheets to observe the lessons and provided feedback. Teachers were also encouraged to supervise themselves as well as to receive feedback from peers in small groups. When teachers had difficulty in attaining the sex equity skills, provision was made for reteaching the skills so that mastery could be attained.

During the Fall 1981 semester, each teacher trained in the microteaching skills was visited at least once in his or her classroom by the trained microteaching supervisor. The supervisor viewed the teacher in actual classroom interaction and held follow-up conferences concerning the mastery of the sex equity skills.

The second phase of training for Intervention I teachers was held on January 9, 1982. During this second phase of training, Intervention I teachers participated in the following activities: (a) a review of the microteaching skills for attaining sex equity in classroom teaching; (b) a discussion of strategies Intervention I teachers used in implementing these skills in their classroom as well as problems and benefits for general classroom effectiveness; (c) a two-hour microteaching session in which intervention teachers implemented these skills in clinical settings; (d) a session on identifying sex bias in instructional materials; (e) a presentation of instructional resources for non-sexist teaching.

C.2 Intervention II: Interactive Problem-Solving for Sex Equity in the Classroom

The interactive problem-solving intervention enlisted teachers in a self-improvement process with peer support and limited outside expert assistance. It was posited that teachers concerned about bias would be able to make changes in their classrooms after some training if they had support and assistance in solving problems that arose. This intervention was designed to have minimal dependence on outside expertise and to develop and foster professional growth and peer support groups.

Teachers were trained in summer 1981 to recognize sex bias in curriculum and instruction and were provided with multiple strategies and resources for changing classroom practices to make them more equitable. They were also introduced to analytic tools that they (or a student or a colleague) could use to diagnose inequitable classroom interaction patterns in their own classes.

Each teacher received a training package to assist their equity efforts. The package was organized according to the project's four target areas -- classroom integration, equitable teaching attention, evaluation of academic work, and behavior management. The training package included diagnostic tools, strategies for improvement, and planning worksheets.

Initial training for intervention teachers took place in August and September, 1981 in three locations: Danbury, Connecticut; the NETWORK offices in Andover (for Lawrence teachers); and Quincy, Massachusetts. Two days of training were provided, introducing teachers to curriculum resources and teaching strategies to use with students to ensure equity in the classroom. Teachers were encouraged to develop their own strategies as well as to adapt activities and ideas to suit their own students.

The first day of the training provided an introduction to general equity issues and then concentrated on bias in curricular materials. After learning to identify bias in materials, teachers were presented with a wide range of curriculum supplements drawn from WEEA products and commercially produced books.

The second day of training focused on interaction patterns. Four areas were covered: Integration by Sex, Equitable Teaching Attention, Evaluation of Academic Work, and Behavior Management. Teachers learned about the kinds of bias problems that occur in each area and ways to diagnose their own classrooms. Suggestions were made about ways to deal with each problem.

After the initial training, two follow-up sessions were held -- one in the fall after diagnosis had occurred and one in the winter. The sessions were each two hours long and were held either after school or as part of inservice days. These sessions focused on peer sharing and problem solving with Intersect staff acting as facilitators rather than experts.

In the follow-up sessions, more time was spent on Behavior Management or discipline issues than on any other topic. Teachers found in their diagnoses that they did treat girls and boys differently -- even for the same kind of behavior -- and they believed that their differential treatment was not "fair." Teachers shared their feelings about handling difficult situations and strategies that had worked for them.

Some of the problems that arose were:

- boys refusing to sit with girls or making negative comments about girls when groups were integrated;
- physically agressive girls;
- other teachers coming into the room and making overtly sexist remarks; and
- boys demanding more attention by calling out or leaving seats.

In evaluations, most teachers said they had found the sessions helpful and that they had made changes in their classrooms because of them. They also said, however, that they would welcome objective feedback from an outside observer knowledgeable about sex equity in the classroom. While it had been suggested that teachers set up peer observations, this did not happen because of difficulties in scheduling and teachers' hesitancy to comment on a colleague's work. Often teachers reported "no problems" in an area of diagnosis and there was no way to check the accuracy of that report.

C.3 Development and Implementation of the INTERSECT Observation System

The primary measurement activity of this project was to code, analyze and evaluate classroom interaction. Most currently available coding instruments focused on teacher and student verbal comments in a global way and did not reveal sufficient information concerning which students were involved in the interaction. Without this precision, usually unavailable in current instruments, this investigation would encounter major coding obstacles. An instrument which focused on and recorded individual student comments was needed. The development, field testing and utilization of the INTERSECT observation system became a major goal and accomplishment of this project.

The INTERSECT system was designed to record the distribution and nature of teacher comments to students. It differed from most observation instruments in several critical ways. First, the race and sex of each student participating in the interaction was recorded. Whenever possible, each student was assigned a number so that the distribution and frequency of teacher interaction in the classroom could be gauged. Secondly, INTERSECT was constructed to respond to relatively recent research findings in the areas of classroom interaction and sex equity. For instance, rather than coding praise and criticism for all teacher reactions, more discrete categories (accept and remediate) were added to more accurately reflect teacher comments. Further, interaction concerning appearance comments and attributions to effort were investigated. INTERSECT was developed specifically to meet the special needs and requirements as outlined in the funding agency's RFP, and is explained in detail in the following section.

C.4 Categories of INTERSECT

The total INTERSECT observation system is included in the appendices and the developmental process is summarized briefly in the previous section. At this point in the report a descriptive overview of instrumentation is offered.

INTERSECT contained four major substantive areas of interaction, and four additional areas of evaluative comments. Together, they could be combined into a grid of 16 potential teacher moves. The four substantive or content areas of INTERSECT can be briefly characterized as follows:

- INTELLECTUAL: concerned cognitive and academically related topics
- CONDUCT: included the behavior and deportment of students
- APPEARANCE: concerned comments about the attractiveness of a student or his/her work
- OTHER: included all comments which did not conform with the three preceding definitions

The four evaluative teacher moves were:

- PRAISE: concerned explicit verbal and nonverbal comments which had the impact of reinforcing student performance
- ACCEPTANCE: referred to comments which were positive but did not have the impact of reinforcing student performance. These were weak in nature (e.g., OK)
- REMEDIATION: referred to constructive teacher comment, usually encouraging or cuing a more acceptable or accurate student response
- CRITICISM: referred to a an explicitly negative verbal and nonverbal teacher comment

Therefore an "O.K.," response to a student academic response would be coded in the intellectual-accept category. A harsh reprimand of student behavior would be coded in the conduct-criticize category. By combining the substantive area of classroom interaction with the evaluative component, INTERSECT provided a picture of a variety of teacher-student interaction patterns.

Aside from this coding system, INTERSECT contained several other components which provided a comprehensive view of classroom interactions. The instrument also recorded how each interaction was initiated. Not only were student and teacher initiations differentiated, but the method of initiation was also coded. Interaction initiated by calling out, assigning, moving, etc., were differentiated on the INTERSECT form. The INTERSECT observation system also included an ethnographic component which allowed observers to record more anecdotal and naturalistic data concerning issues related to sex equity and sex bias. These data, termed "tone-setting incidents," were recorded in several categories including: (1) entry, exit, and transition behavior; (2) classroom digressions; (3) assignment of classroom tasks and jobs; (4) sex segregation or integration; (5) sex bias or equity in language; (6) discipline; and (7) salient students.

C.5 Sample Selection

This study undertook the task of acquiring a large and diverse sample for analysis, a sample which would strengthen the generalizability of study findings. As an underlying assumption, the project co-directors and staff believed that more variability in teacher-student interaction patterns was to be found through contrasting numerous classrooms than through a more intensive observation of a few selected classrooms. An investigation of the behaviors of a small number of teachers might magnify individual and unique teaching behaviors, while not adequately reflecting the repertoire of behaviors found in other teaching styles.

A review of the body of research also suggested additional variables which might have an impact on teacher-student interaction: race and sex of teacher, the racial composition of students, and the nature of subject matter being taught. A small sample could not accommodate an analysis of these variables. Therefore, the co-directors and staff selected classrooms from a population that would allow these additional inquiries.

The sample selected for this investigation consisted of slightly over 100 classrooms (N-102), including fourth, sixth and eighth grade classes. These classrooms were located in six different school districts, including Prince William County, Virginia; Baltimore City, Maryland; Lawrence and Quincy, Massachusetts; Danbury, Connecticut; and the District of Columbia. The classrooms analyzed in the sample represented urban, suburban, and rural areas as well as two distinct geographic regions of the nation. They also encompassed predominantly majority, predominantly minority, and integrated classrooms. For the purpose of this study, these classrooms were defined as follows:

- predominantly majority -- classrooms where 75-100% of the students are not members of a minority

- mixed or integrated -- classrooms where 35-50% of the students were members of a minority

- predominantly minority -- classrooms where at least 75% of the students were members of a minority

The full complement of mixed and predominantly minority classrooms was not achieved for the problem-solving intervention. There were several factors responsible for this. First, a number of New England teachers assigned to 4th, 6th or 8th grade classrooms, or to integrated classrooms, had their assignments changed between the middle of the summer and the beginning of September. Several of these transfers were due to state and local budgetary factors (e.g., Massachusetts Proposition 2-1/2) which resulted in a reduction of force and new teaching assignments. This attrition, however, occurred at the same time that second year project funds were reduced by 10%. Collecting data from the original and higher number classrooms would have been difficult within this reduced level of project resources. The final sample size for the problem-solving intervention was 30 classrooms (fourteen majority, seven mixed, nine minority).

Although budgetary reductions and new teaching assignments also had an impact on the microteaching intervention classrooms, these changes were relatively few in number and were generally confined to the Baltimore City public Schools. Forty-five microteaching classrooms were included in the sample (16 majority, 14 mixed and 15 minority). A total of 31 control classrooms were also observed and coded (16 from New England and 15 from the Washington-Baltimore metropolitan areas). Of of these control classrooms, 11 were populated by majority students, 11 were mixed, and 9 were predominantly minority.

Sample diversity was also achieved in relation to grade level and subject matter. In the problem-solving intervention, there were 10 fourth grade, 8 sixth grade and 12 eighth grade classrooms. In the microteaching treatment, there were 15 fourth grade, 15 sixth grade and 15 eighth grade classrooms. The control condition consisted of 10 fourth grade, 10 sixth grade and 11 eighth grade classrooms. In terms of subject matter, 48 classrooms were language arts, 43 classrooms were mathematics/science, and six classrooms were concerned with other academic school subjects.

During our first round of observations, data was collected from 102 classrooms. Forty-three of these classrooms in the metropolitan Washington and Baltimore areas had teachers trained in the microteaching intervention, and 24 New England classrooms had teachers trained in the problem-solving intervention. Thirty-five classrooms served as controls; 18 were from New England and 17 from the Washington and Baltimore metropolitan areas. The sample contained 33 fourth grade classrooms, 30 sixth grade classrooms, and 39 eighth grade classrooms. Forty-four classrooms had a significant number of non-minority students (32 mixed and 26 predominantly minority). In this observation, 35 classroom teachers were black, 66 teachers were white and one teacher was Hispanic. Thirty of these classrooms were taught by males and 72 by females. Forty-eight of the sessions observed were language arts, 48 were mathematics or science, and 6 were other subject areas such as social studies.

During the second round of observations, data were collected from 93 classrooms. Forty-two classrooms in the Washington-Baltimore area were part of the microteaching intervention, and 22 New England classrooms had teachers trained in the problem-solving intervention. Twenty-nine classrooms served as controls. This sample included 32 fourth grade classrooms, 31 sixth grade classrooms, and 39 eighth grade classrooms.

Thirty-eight classrooms were composed predominantly of non-minority students, 24 were composed predominantly of minority students, and 31 had a mix of minority and non-minority students. In total, 31 black teachers, 61 white teachers and one Hispanic teacher were observed. Twenty-four of the teachers were male and 69 were female. Forty-four of the sessions observed were language arts, 46 were mathematics or science, and three were other subjects.

Ninety-seven classrooms were observed during Time III, the third round of observations. Forty-four classrooms observed in the Washington-Baltimore area had teachers trained in the microteaching intervention, and 23 classrooms in New England had teachers trained in the problem-solving intervention. Thirty classrooms served as controls: 15 were in the Washington-Baltimore area and 15 were in New England. Forty classrooms were composed predominantly of non-minority students, 27 were composed predominantly of minority students. Of the teachers observed, 33 were black, 63 were white, and one was Hispanic; 28 were male and 69 were female. Forty-six of the sessions observed were language arts, 46 were math or science, and five were other subjects.

C.6 Rater Training and Reliability

Each observer was trained in two approaches to classroom observation: The INTERSECT coding system and ethnographic analysis. The observers were instructed to spend 30 minutes of each classroom observation coding interactions on the INTERSECT instrument, and remaining ten minutes describing classroom activities.

The INTERSECT observation system was developed and field tested during Year 1 of this project. The instrument was designed to build on key research findings concerning teacher-student interaction, reviewed by several prominent researchers, and field tested in 36 classrooms.

The user's manual and several training sessions were used in establishing a satisfactory level of interrator reliability. The user's manual provided precise definitions and examples for each of the INTERSECT categories. The user's manual provided the basis not only for initial training, but an available reference for questions that arose after training was completed. The training sessions consisted of coding both live and videotape classroom scenarios, and comparing results. Differences in coding were analyzed and discussed. Raters practiced using INTERSECT in one day of live classroom interaction and two days of videotaped classroom scenarios. Finally, two videotapes were coded by each observer. Each of the videotapes required 52 separate codes in order to accurately record the interaction on INTERSECT. Raters lost points for inaccurate coding, omitting an interaction from INTERSECT, or adding an interaction which did not take place. Each rater was given a percentage score for the number of accurate codes. The Washington-Baltimore area reliability was established for the four raters at 96%, 96%, 96%, 90%. For the New England raters, reliability was established at 86%, 85%, 84% for the three raters at that site.

The ethnographic training consisted of reading related materials, reviewing the tone setters section of the INTERSECT user's manual and practice recording of both live and videotaped classrooms. As in the case of the INTERSECT coding section, discussions and analysis of ethnographic findings were pursued in the training sessions. The INTERSECT co-directors and staff identified the three salient tone setters appearing on two videotapes of classroom interaction. Each rater was then asked to identify the major tone setters in these videotapes, and minimum score of five of the six was established as acceptable. All raters identified at least five of the six tone setters present.

C.7 Coefficient of Distribution

The coefficient of distribution represents a new concept, and a brief description is appropriate. For each of the categories, the mean frequency per (30 minute) observation was calculated. Then a coefficient of distribution was calculated for all boys, all girls, all minority boys, and all minority girls in these classes. The coefficient characterized the degree to which the boys, girls, minority girls, and minority boys participated in the interactions proportional to their enrollment in class. What follows is an example of how these coefficients of distribution were calculated.

The distribution of intellectual praise between males and females in one classroom would be calculated as follows:

1. Count the total number of students in the class (e.g., 25 students).

2. Count the total number of males present, then the number of females (e.g., 10 males and 15 females).

3. Divide the total number of males by the total number of students, then divide the total number of females by the total number of students. This will yield the expected percentage of interactions for each sex.

   Example:

   $\frac{10}{25}$ - 40% (expected contact for males)

   $\frac{15}{25}$ - 60% (expected contact for females)

4. Count the total number of contacts for all students in the category being examined (e.g., the teacher praised students 10 times).

5. Count the total number of times teacher praise was directed at females, then count the total number of times teacher praise was directed at males (e.g., the teacher praised males 5 times and females 5 times).

6. Divide the number of praises for males by the total number of praises for all students, then divide the number of praises for females by the total number of praises for all students. This will yield the actual percentage of interaction for each sex concerning praise.

   Example:

   $\frac{5}{10}$ - 50% (expected praise for males)

   $\frac{5}{10}$ - 50% (expected praise for females)

7. Compare the result in Step 3 (the expected percentage, with the results in Step 6 (the actual percentage) by subtraction. The difference between the two is called the coefficient of distribution or the coefficient of equity. If the coefficient of equity is a positive percentage, the sex is getting more attention than expected. If the coefficient of equity is a negative percentage, the sex is receiving less attention than expected.

Example:

50% actual female praise
- 60% expected female praise
- 10% less female praise than expected given the number of females in the class

30% actual male praise
- 40% expected male praise
+ 10% more male praise than expected given the number of males in the class

By combining the mean number of interactions per observation for any group (i.e., grade, condition, location) with the coefficient of distribution, we can paint a picture of interaction during a school day.

Let us continue with our example of praise. Initially, suppose we determine that the mean number of interactions falling in the category of praise during a 30-minute observation is 9. Also the coefficient of distribution for this same classroom is +40% for males and -40% for females. We know, therefore, that males receive approximately 40% more intellectual praise than expected by their proportion of enrollment, and girls receive 40% fewer of these interactions than expected.

Since, on the average, there are 9 praise interactions in a half hour, there are about 108 (9x12) of these interactions in a six-hour school day. Therefore, 108 interactions is the quantity that is being distributed with a 40% disparity. In this case we could estimate that boys are getting approximately 43 more interactions of praise than expected and girls 43 less on an average school day. Note that if the mean per observation was only one interaction, there would only be 12 in a six-hour day; in that case, +40% coefficient of distribution would not be as big a disparity as it was on the previous example. Therefore, throughout our report, we always consider the mean and coefficient of distribution together when interpreting results.

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II. QUANTITATIVE ANALYSES OF DATA FROM INTERSECT OBSERVATION SYSTEM

In this report we examine the difference in interaction with boys and girls across treatment groups using three methodological approaches. In the first approach data was aggregated across classrooms within each treatment group. The distribution of interaction between males/females and the teacher was compared by treatment groups. First we compared microteaching classrooms to problem-solving classrooms. Next, we compared the control group with the microteaching and problem-solving classrooms together. Tables marked "A" display the results of this method, and note any statistically significant differences we found between the three treatment groups.

In the second method used we looked at the interaction with boys and girls in each individual classroom to see if there were any significant differences. Based on the results of this significance test with the classroom as the unit of analysis, each class was labelled as significantly favoring boys in interaction, significantly favoring girls in interaction or reflecting no bias in favor of either sex in interaction. We then looked at the distribution of these three types of classrooms within each treatment group: what percentage favored boys, what percentage favored girls and what percentage were not biased in favor of either sex. A chi-square test was then done to compare the distribution of these classrooms across treatment groups. Tables marked "B" display the second method of analysis.

For selected interaction data, additional analyses were performed. These analyses provided data on both the total number of interactions and the difference between interactions directed at boys and girls. The results of this three way multivariate analysis (treatment x subject x grade) is displayed for Observation III only on the relevant graphs in each section and within the text itself. The relevant tables reporting both the univariate and multivariate analyses for Observations I and III are presented in Appendices A and B. The methodological considerations for these statistical analyses are provided in the following section.

A. Methodological Objectives

While the coefficient of distribution is an adequate descriptor for a teacher/classroom, it can not readily be used for between teacher/classroom comparison. The main problem in using this coefficient for comparison is the fact that the computed index for each teacher/classroom is a sample statistic based on observations obtained from that teacher/classroom. Because of the differences in composition of the classrooms, (e.g., ratio of boys to girls, the total number of observed interactions between teacher and students), the sampling characteristics of these indices are different from teacher to teacher. As a consequence, the usual data analysis procedures based on the linear model are not applicable.

The purpose of this section is to explore the issues involved in using these kinds of indices for comparison and to discuss the strategies we used. First, a conceptual model will be developed to account for the teacher student interaction in each classroom, so that an appropriate distributional model can be obtained for the index. Then methods used to test the hypotheses of treatment difference will be discussed.

B. Theoretical Framework

In this study, the multinominal model was used to model classroom interaction between teacher and students. In this model, each student is assumed to have a probability of p_i, $i = 1 \ldots, n$, (where n is total number of students) of being called upon by the teacher at any given instance of interaction. Thus, the sum of the p_i's is equal to one. Assuming that each instance of interaction occurs independently, then for fixed T, the total number of observed interactions, the observed frequencies of interaction, t_1, t_2, $\cdot \cdot \cdot$, t_n, between the teacher and each of the n students, will have a multinominal distribution with parameters, T and the p_i's.

In this study, since it examined sex equity in classroom interaction, it is further assumed that the p_i's are constant for boys and for girls. That is, $p_i = p_b$, if the ith student is a boy, and $p_i = p_g$, if the ith student is a girl. This means that all boys are equally likely to be called upon by the teacher with probability, p_b, and likewise, all the girls with probability, p_g. If $p_b = p_g$, then the teacher does not favor boys over girls nor girls over boys.

Using the method of maximum likelihood, the maximum likelihood estimator, $\hat{p}_b$, for p_b is equal to t/bT, where t is the total number of interactions involving boys, b is the total number of boys in the class and T is the total number of interactions observed. (This maximum likelihood estimator is also an unbiased estimator for $\hat{p}_b$.) When T is large, this estimator is normally distributed, with an asymptotic variance, $p_b(1-bp_b)/bT$. Thus for large T, the sampling variance of p_b can be obtained by substituting $\hat{p}_b$ for p_b.

The asymptotic result can also be used to test hypotheses about sex equity in classroom interaction in a particular classroom. If there is no sex bias, p_b should equal p_g. Since the sum of the p_i's must equal one, this implies that $p_b = p_g = 1/n$. Then a test of the null hypothesis, H_o: $p_b = 1/n$ will be a test of no sex bias in classroom interaction. When T is large, the test statistic,

$$z = \frac{\hat{p}_b - 1/n}{(\widehat{V(\hat{p}_b)})^{1/2}}$$, where $\widehat{V(\hat{p}_b)}$ is the estimated sampling variance by susbtituting 1/n for $\hat{p}_b$,

will be approximately normally distributed with mean zero and variance one. Interestingly, the numerator of the test statistic is a linear transformation of the coefficient of distribution differed by a factor of b. In other words, a test of the H_o: $p_b = 1/n$ is equivalent to the hypothesis that the coefficient of distribution equals zero.

C. Methods of Comparison

Given the conceptual model described above, it can be seen from the asymptotic variance of p_b, that the variance for each observation (i.e., the sample coefficient of distribution for each teacher) will be different from teacher to teacher. Thus, traditional methods of data analysis, which are based on the linear model and the assumption of homoscedasticity, will not be appropriate. These include t-test, analysis of variance and regression analysis. Alternatively, two different approaches will be discussed.

In order to compare the effects of the planned interventions, one approach is to use the test statistic developed in the previous section to test the hypothesis of sex equity in classroom interaction for each teacher. Then the teachers for whom we observed sex equity in classroom interaction can be tallied and compared among the three treatment groups (microteaching, problem-solving and control) using the Chi-square test of independence. This approach allows the researcher to determine whether or not the interventions have any effects when compared with the control group. If the Chi-square test is significant and the proportion of inequitable teachers is highest for the control group, the researcher can conclude that teachers who had received the training are more likely to promote sex-equitable classroom interaction.

This vote-counting method, however, fails to account for those changes in magnitude and direction which do not affect the vote counts. The vote-count method requires a yes/no decision about sex equity in interaction in each classroom. Therefore, a teacher who was extremely inequitable about interacting with boys and girls both before and after an intervention would have the same "no" score as a teacher who has been inequitable prior to the intervention but had become equitable to a degree just short of statistical significance. This distortion in multiple classrooms within any one treatment group could lead to erroneous conclusions concerning the effects of interventions. Even though the interventions may have a significant impact on the patterns of interaction, the Chi-square test of independence fails to yield a significant result.

To deal with this problem the second approach is to estimate the coefficient of distribution directly for each teacher/classroom. Since the estimated coefficients are asymptotically normally distributed, assuming that each teacher behaves independently, it is safe to assume that the estimated coefficients (for all teachers in the three groups) will have a joint multivariate normal distribution with a diagonal variance-covariance matrix. (That is, the sample variance for each estimated coefficient will be on the diagonal and zero elsewhere.) Any linear combination of these estimated coefficients will be approximately normally distributed with the variance made up of sample variances of the estimated coefficients.

If the above is true, hypotheses about treatment differences can be tested using contrasts. If there is more than one contrast to be tested, the Bonferroni inequality can be used to control for the overall Type I error rate. Each of these contrasts can be tested using the standard normal distribution as the approximate referenced distribution. To interpret the statistical significant results, the researcher must keep in mind that the contrasts are based on the average estimated coefficients for each group. The differences among treatment groups could be due to a few cases of extreme values in each group. If the differences are caused by extreme values in each group, then concluding that there is an overall treatment effect is unjustified.

Although this approach allows the treatment of the size of "effect" directly, the inferential procedure depends on treating the teachers as a "fixed" sample. The use of the term "fixed" is similar to that in the context of analysis of variance, (e.g., "fixed" effects), or that in the context of regression analysis, (e.g., "fixed" predictors). In other words, the inferential procedure does not take into account the fact that the teachers represent a random sample from some well-defined population for which inferences are intended. In this approach, statistical inferences are limited to the same group of teachers being observed possibly at different times.

Each table is accompanied by explanatory narrative which includes 1) a definition of the particular category of interaction presented and discussed; 2) presentation of findings concerning the category of interaction; and 3) a brief discussion of the findings and their implications.

D. Results of Analyses

D.1 Interactions in the Classroom

Definition: Interaction is defined as a verbal exchange in which a teacher reacts to a student comment or behavior. This exchange can be initiated by either the teacher or the student, and can concern any issue from academic activities to classroom management, from praising the appearance of a student's paper to criticizing a violation of school rules. All such interactions were coded in one of sixteen categories.

Findings: Table 1A displays the descriptive statistics concerning the total amount of interaction in each classroom and the results of tests using the first method which aggregated data across classrooms before testing for statistically significant differences. As in all tables designated "A", in Table 1A column one displays the condition within each observation (problem-solving, microteaching or control). Column 2 shows the number of classrooms in the sample which contain that type of interaction. So, in Table 1A, we see that during the first observation there were 24 problem solving classrooms in which we observed interaction, 43 microteaching classrooms and 34 control classrooms. Column 3 presents the mean frequency of interaction for the classroom by condition. So, in Table 1A we see that during Observation I the 24 problem-solving classrooms had an average of 85 interactions per observation, but during Observation II, the 22 problem-solving classrooms only had an average of 72 interactions per observation. Column 4 indicates the percentage of distribution of these interactions going to boys and girls as compared to the expected distribution of interaction of teachers not favoring either sex. A positive percentage indicates boys were receiving more interaction than would be expected in an equitable classroom; a negative percentage indicates that girls were receiving more interactions than would be expected in an equitable classroom. A zero would reflect perfect equity in the distribution of interaction between males and females.

So, in Table 1A during Observation I in the 24 problem-solving classrooms boys got 2% more of the total interaction than would be expected. Columns 5 and 6 display the equity of distribution for minority boys and girls. In these two columns a positive percentage indicates that the gender received the displayed percent more interaction than expected, and a negative percentage indicates that the gender received the displayed percent less interaction than expected. "NA" indicates there were too few minority students in the classroom to calculate reliable coefficients of distribution. At the bottom of each observation section of the table are the results of significance tests: test one compares the microteaching with the problem-solving classrooms; test two compares the problem-solving and the microteaching classroom with the control. For these tests, $p \leq 01$ when $Z > 2.58$ or $Z > -2.58$.

All classrooms observed in this study contained interactions. In the 30-minute observation period used for coding INTERSECT, there was an average of 73 interactions per class during the first observation, 66 interactions per class during the second observation, and 65 interactions per class during the third observation. This indicates an average of slightly more than two interactions per minute in the classes observed (Table 1A).

The frequency of classroom interactions decreased over time, especially between the first and second observations (73 interactions in Observation I, 66 interactions in Time II). The microteaching classes contained more interactions than the control condition in all three observations. The problem-solving classes contained more interactions than the control classes in the first two observations, but dropped behind the control group at Observation III (See Table 1A).

In the microteaching classes, interactions were equitably distributed between girls and boys during all three observations. The differences in distribution were consistently less than 1 percent. In the control and problem-solving classes, the distribution of interaction between males and females became more and more imbalanced during the year, with boys receiving more interactions than their representation in class populations.

In the first observation, interactions in the microteaching condition were virtually equitable, with boys receiving fewer than 1% more interactions than girls. However, in the problem-solving and control classrooms boys were getting 2% and 5% more contact than girls. This translated to boys in problem-solving classes having approximately 20 more interactions with the teachers than expected in an equitable classroom in a six-hour school day. In the control classes, boys received approximately 40 more interactions than expected in a comparable time frame. By the third observation the boys in problem-solving classes received 29 more interactions than expected and boys in control classrooms 54 more interactions than expected, in a six-hour school day. In the microteaching classes, however, even during the third observation, there was still less than a 1% difference in the number of interactions teachers had with boys and girls in the class.

Minority students in the control classes received fewer interactions than majority students in all three observations. In the microteaching condition, the underrepresentation of minority students in classroom interaction existed in Observation I and, for minority boys only, in Observation II. Minority girls in Time II received 2% more interaction than would be expected in an equitable classroom, but by Observation III in the microteaching classes virtual equity was reached for both minority girls and boys.

Table 1A shows there was a statistically significant difference in the distribution of interactions awarded to boys and girls during Observation I in the treatment groups (microteaching and problem-solving) when compared to the control group (-2.5801). In Observation III, an even stronger statistically significant difference emerged between the treatment groups and the control group (-3.8555). During Observation I and III, boys received significantly more interaction in the control group than in either of the treatment conditions. During Observation II, boys received significantly more interaction in the problem solving group when compared to the microteaching group. In fact, it was only in the microteaching group, Observation II, that girls received slightly greater number of interactions than expected. It is also of interest to note that in Observation III, the microteaching condition reflected perfect equity in the number of interactions distributed to boys and girls, while the control condition reached its highest level of inequitable distribution (.0000 v. .0723).

TABLE 1A: COMPARISON OF TEACHER-STUDENT INTERACTIONS FOR MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

COEFFICIENT OF DISTRIBUTION BY CONDITION

(1)	(2)	(3)	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
Condition	Number of Classrooms	Mean Interactions Per Observation	(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	85	2.0%	NA	NA
Microteaching	43	73	0.7%	-2.0%	-4.0%
Control	35	67	5.0%	-3.0%**	-2.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.2473	
Test 2: Problem-solving & microteaching vs. control:				Z = -2.5801***	
OBSERVATION II					
Problem-Solving	22	72	4.0%	NA	NA
Microteaching	42	65	-0.2%	-[illegible].0%	2.0%
Control	29	64	4.0%	-6.0%**	-0.09%**
Test 1: Problem-solving vs. microteaching:				Z = 2.7211***	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.1909	
OBSERVATION III					
Problem-Solving	23	60	4.0%	NA	NA
Microteaching	44	68	0.1%	0.1%	0.3%
Control	30	64	7.0%	-3.0%**	-5.0%**
Test 1: Problem-solving vs. microteaching:				Z = 2.1120	
Test 2: Problem-solving & microteaching vs. control:				Z = -3.8555***	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

Table 1B displays the results of analyses using the method which treated the individual classroom as the unit of analysis. The first two columns of this table are identical to the previous tables. In Table 1B, Column 1 indicates the condition and Column 2 the number of classrooms observed for that type of interaction. So in Table 1B again we see there were 24 problem solving classrooms in Observation I. Columns 3 through 5 indicate the percentage of the classrooms in that row which were found to significantly favor girls (Column 3) reflect no bias in favor of either sex (Column 4) and favor boys (Column 5). In Table 1B we see that of the 24 problem solving classrooms, 16.7% significantly favored girls in terms of amount of interaction, 29.2% significantly favored boys in terms of amount of interaction, and 54.2% favored neither sex. A chi-square was used to calculate whether these distributions were statistically different from each other, with $p<.05$ indicating marginal statistical significance and $p<.01$ statistical significance.

In viewing the individual classroom as the unit of measure (Table 1B), a marginal level of significance was achieved only in Observation II. Although the majority of classrooms (54.5% to 88.1%) did not reflect bias, when bias was present, it favored boys far more frequently then girls in the problem solving (26.1% v. 13%) and the control (27.9% v. 4.4%) classrooms. In the microteaching classrooms, the number of biased classrooms was evenly split in Observation I between males and females, favored females in Observation II (7.1% v. 4.8%) and favored boys only in Observation III (20.5% to 9.1%). It is interesting to note that by Observation III, the percentage of classrooms favoring boys increased in both the microteaching and control conditions.

In the multivariate analysis reported on Table 1A for Observation III, only significant differences among grades were found for the total of all interactions, ($p \leq .007$). As shown in Figure 1, the number of interactions decreased as the grade level increased. The higher rate of interaction between the fourth and sixth grade, (average of almost 70), on the one hand and eighth, (average of 55), on the other was the source of the significant differences.

Figure 1: AVERAGE NUMBER OF TOTAL INTERACTIONS PER CLASSROOM BY GRADE LEVEL FOR OBSERVATION III

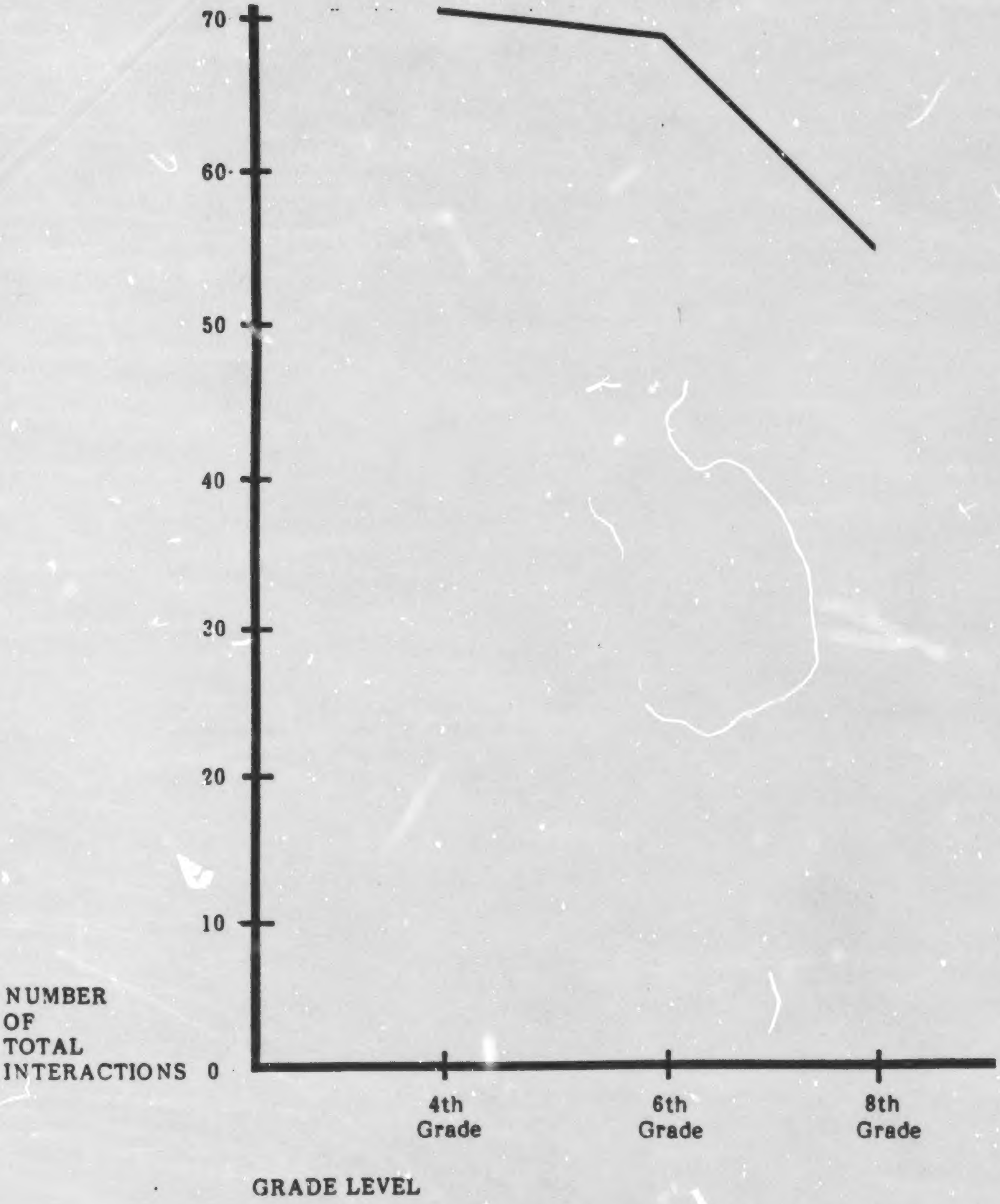


TABLE 1B: TOTAL TEACHER INTERACTIONS WITH STUDENTS IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	16.7%	54.2%	29.2%
Microteaching	43	9.3%	81.4%	9.3%
Control	34	2.9%	70.6%	26.5%
	CHI-SQUARE = 8.8131		P ≦ 0.0659	
OBSERVATION II				
Problem-Solving	22	13.6%	54.5%	31.8%
Microteaching	42	7.1%	88.1%	4.8%
Control	29	6.9%	75.9%	17.2%
	CHI-SQUARE = 10.1348		P ≦ 0.0382	
OBSERVATION III				
Problem-Solving	23	8.7%	73.9%	17.4%
Microteaching	44	9.1%	70.5%	20.5%
Control	30	3.3%	56.7%	40.0%
	CHI-SQUARE = 5.0971		P ≦ 0.2775	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Discussion: The data support the many studies documenting the high rate of classroom interaction. The observations in different geographic locations, different subject matter disciplines, and in all three conditions reported a high number of teacher-student exchanges averaging more than two per minute. There was also a trend toward decreasing interactions over time, both during the year and over the years.

For example, a large decrease occurred between Observation I (73 interactions) and Observation II (65 interactions). One explanation for this finding may be the teacher's need to establish classroom norms and expectations at the beginning of the academic year. Academic and classroom management expectations and rules are established at the beginning of the year, and this effort may require additional interaction.

As reported in the Year 2 Final Report, the two treatment groups contained a higher frequency of interactions than the control group during Observations I and II, but only the microteaching condition maintained this higher frequency during Observation III. This may indicate that the treatments, although designed to ensure an equitable distribution of interaction, may also have had the secondary impact of increasing interaction overall. Second the dramatic decrease of interactions in the problem-solving classes (85 in Observation I to 60 in Observation III) suggests that the effects of this treatment may not have persisted over time.

It also appears that the interactive nature of the classroom decreased as the grade level increased. The fourth grade classes had the highest frequency of interactions, while the eighth grade classes had the lowest frequency. It appeared that classes became more teacher directed with increasing grade level. In fact, in a related dissertation done at the college level with a modified version of the Intersect instrument, this pattern of interaction persisted. Classes at the college level had a lower rate of interactions than the eighth grade classes, continuing the trend of decreasing interactive frequency with increasing grade level. This may support the common perception that schools become more subject matter oriented and teacher centered and less student centered as the grade level and student maturity increase.

In both Observations I and III, the treatment conditions reflected statistically significant and marginally significant findings in relation to the coefficient of distribution. Tables 1A, 1B, and Table 1 in Appendix B are mutually supportive of the marginally significant differences between the treatment and control groups. By Observation III, 40% of the classrooms in the control condition reflected a bias in favor of boys (Table 1B), there was a significant difference between the coefficients of distribution (treatments .1 and 4.0 contrasted with the controls 7.0) on Table 1A, and a marginally significant difference (.057) in the treatment effect of the multivariate analysis (Appendix B, Table 1). The congruence of findings using these three approaches (later underscored in the sections on sequencing and salient students) adds strength to the clear, although not always statistically significant, differences among the three treatments.

Female students in the treatment conditions were more likely to interact with the teacher in these classrooms than in the control classrooms. In Observation II, females in the microteaching classrooms were more likely to receive an equitable number of interactions than females in the problem-solving classes. In fact, during Observation II the girls in the microteaching condition received slightly higher number of interactions than the boys in microteaching condition. By Observation III, equity in the total number of interactions was achieved in the microteaching condition. On the other hand, by Observation III, the control classes reflected their poorest coefficient of distribution with boys receiving an inequitable share of total interactions, more than in any other condition in any other observation. While the performance of the problem-solving group was uneven, the contrast between the microteaching and control groups grew stronger over time.

In looking at the results reported on Table 1B, it may be helpful for the reader to consider her/himself the parent of a child about to enter one of three groups of classrooms: problem-solving, microteaching or control. For example, in Observation I the likelihood of a child being placed in a classroom with an equitable distribution of interactions was greater in the microteaching condition (82%) than in either the problem-solving (54%) or control groups (71%). If a child was placed in a classroom with a significant level of bias, it would again be important to consider in which group of classes this child was being placed. In the control situation the biased classes favored boys nine times more frequently than girls (26.5% v. 2.9%). In Observation I again, the biased classes in the problem-solving condition favored boys about twice as often (29.2% v. 16.7%). In the microteaching situation, the percentage of biased classes were evenly split (9.3% and 9.3%). Clearly, a female student would have the best opportunity of receiving an equitable number of interactions in the microteaching classrooms.

By Observation III, almost half of the control classes were characterized by significant levels of bias (43.3%) and the overwhelming majority of these biased classes favored boys (40.4% v. 3.3%). The problem-solving and microteaching conditions deteriorated in effectiveness as well, although not as dramatically. Almost a third of these classes were marked by bias, and this bias favored boys twice as often as girls. It is interesting to note that by Observation III, a child would be more likely to be placed in a biased classroom in the control group than in either of the treatment groups; and in the control group, these classrooms favored males twelve times more frequently than females.

D.2 Teacher Praise of Student Behaviors and Responses

Definitions: All teacher comments that positively reinforced student comments and behavior were coded in the praise category. Comments such as "Excellent job," "You've made a great improvement" and "You're behaving much better today" were all recorded as praise. When fairly neutral comments such as "O.K." were accompanied by a positive voice intonation and non-verbal cues, this was also recorded as praise. Thus, the praise category was defined fairly broadly and reflected teacher approval, by either intonation or content, of student actions and performance.

Findings: Data from all three observations indicate that, in most classes, praise was present in student-teacher interaction, but at a fairly low frequency. During Observation I (N = 102) praise occurred in 86% of the classrooms, on the average of 9 times per observation. During Observation II (N = 93) praise occurred in 82% of the classrooms, on the average of nine times per observation; and during Observation III (N = 97) praise occurred in 84% of the classrooms on the average of 8 times per class. The percentage of classrooms in which praise occurred and the frequency of its use were fairly consistent over time. When praise was used by a teacher, on the average it constituted only 12% to 14% of total classroom interaction.

As Table 2A indicates, praise was used in a greater number of microteaching classrooms than in either the control or problem-solving conditions. In 93% to 98% of microteaching classrooms where praise was used, it occurred on the average of 11.7 times per observation. This is about 1.5 times more than the average 7.3 times in control classrooms, and over three times the average 3.7 times in problem-solving classrooms. Praise also occurred in a higher percentage of microteaching classes (93% to 98%) than in any other condition (64% to 85% problem-solving; 74% to 79% control).

The distribution of teacher praise to males and females differed in the various conditions. In Observation I, in all classes, male and female students received an equitable amount of praise. The small variance in distribution, a maximum of 1% of the seven interactions noted in the 30 minute control group observation, comes to less than one interaction per 6-hour school day. However, in Observation II, inequities in the distribution of praise occurred. In the problem-solving classroom girls received 10% less praise than expected and boys 10% more; in the control classrooms girls receive 7% less and boys 7% more.

By Observation III the coefficients of distribution for the control and problem-solving classes had deteriorated even further. The control classes registered a ±10% difference in the distribution of praise between girls and boys, while the problem-solving classes had fallen to ±14%. Even the microteaching condition had dropped slightly to ±2%. There were no clear patterns concerning minority students.

Statistically significant differences were found during Observation III between the problem solving (14%) and microteaching (-2%) conditions (Z = 3.7485). Boys received significantly more praise in the problem solving condition than expected and girls slightly more praise in the microteaching condition than expected. The differences in other comparisons and during other observations, while of potential educational import, were not statistically significant. The direction of change indicates that the microteaching condition maintained equitable distribution while the problem-solving and control conditions showed a deterioration in the distribution of equity.

In Table 2B, few differences were detected at the classroom level. In all conditions and at all times, 85% to 100% of the classrooms did not reflect bias. When bias did appear, no particular pattern by condition or sex was found.

TABLE 2A: COMPARISON OF TEACHER PRAISE OF STUDENT BEHAVIORS AND RESPONSES FOR MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1)	(2)	(3)	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
Condition	Number of Classrooms	Mean Interactions Per Observation	(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	20	5	0.8%	NA	NA
Microteaching	42	13	-2.0%	0.6%	-5.0%
Control	26	7	1.0%	-8.0%**	-9.0%**
Test 1: Problem-solving vs. microteaching:				Z = 0.8251	
Test 2: Problem-solving & microteaching vs. control:				Z = 0.1490	
OBSERVATION II					
Problem-Solving	14	3	10.0%	NA	NA
Microteaching	40	11	-1.0%	-1.0%	-2.0%
Control	23	8	7.0%	0.2%**	-3.0%**
Test 1: Problem-solving vs. microteaching:				Z = 2.4350	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.7894	
OBSERVATION III					
Problem-Solving	18	3	14.0%	NA	NA
Microteaching	41	11	-2.0%	-0.7%	-0.7%
Control	22	7	10.0%	2.0%**	5.0%**
Test 1: Problem-solving vs. microteaching:				Z = 3.7485***	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.9837	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

Discussion: The microteaching condition reported a frequency of praise greater than or equal to the combined frequency of both the control and problem-solving classes. In addition to the higher use of praise, the microteaching classes maintained an equitable distribution of praise over the three observations. However, as Table 2A indicates, this rarely was statistically significant. The difference between the coefficient of distribution in problem-solving classes and the microteaching classes was statistically significant only in Observation III.

Perhaps one of the clearest findings is the higher rate of praise in the microteaching condition for both boys and girls. Although the coefficient of distribution was most equitable as well, the total number of praise was clearly so much higher in the microteaching condition that one might conclude that these classrooms represent more supportive educational environments for all students.

Since praise was a relatively infrequent interaction, a 7%, 10%, or 14% difference in distribution between girls and boys did not result in a great difference in the actual number of praise interactions. However, two points should be kept in mind. Because praise was such an infrequent interaction, its impact on students may have been particularly powerful. Praise may have constituted a rare and valuable reward. Its impact may be educationally, if not statistically significant. Second, the 30-minute observation period provided only a limited view of a school day. Over the course of an entire school day, six hours for example, the difference in distribution of praise between girls and boys would have been far more dramatic. For instance, by Observation III, the coefficients of distribution between females and males had reached 14% in problem-solving classes and 10% in control classes. In problem-solving classrooms girls would receive approximately 14% less praise than expected or five fewer occurrences of praise in a six-hour day. In the control classrooms there would be 10% or eight fewer occurrences of praise per classroom for girls than expected in a school day. In a control classroom this would translate to a 16 contact variance in the praise given to boys and girls during a typical school day.

The data suggest that a growing trend of inequity toward girls developed in the control and problem-solving groups. Over the course of the school year, girls received less than their share of praise in these two conditions. The microteaching condition countered this trend and maintained virtual equity over time.

Approximately 15% of the classes observed in Observations I, II and III did not contain even a single incidence of praise. At this point, we do not know if this 15% represented the same or different classrooms in Observations I, II and III. If a large portion of the 15% represented the same classrooms in all three observations, then there may have been a sub-population of classrooms in which praise simply did not exist. If the 15% refers to a changing group of classrooms, then one might conclude that praise is indeed a rare interaction, but one that exists in all classrooms.

TABLE 2B: TEACHER PRAISE OF STUDENT BEHAVIORS AND RESPONSES IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	20	5.0%	85.0%	10.0%
Microteaching	41	0.0%	95.1%	4.9%
Control	25	0.0%	96.0%	4.0%
	CHI-SQUARE = 4.2877		P ≤ 0.3685	
OBSERVATION II				
Problem-Solving	13	7.7%	92.3%	0.0%
Microteaching	40	10.0%	87.5%	2.5%
Control	23	9.7%	87.0%	4.3%
	CHI-SQUARE = 0.6995		P ≤ 0.9514	
OBSERVATION III				
Problem-Solving	17	0.0%	100.0%	0.0%
Microteaching	41	7.3%	90.2%	2.4%
Control	21	0.0%	95.2%	4.8%
	CHI-SQUARE = 3.7545		P ≤ 0.4403	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Table 2A shows no statistical significance in condition comparisons, aside from the difference between the two treatment groups reported in Observation III. In most classes, no statistical levels of bias were recorded, nor were any patterns detected at the classroom level (Table 2B). Clearly, the low frequency of praise attenuated statistical impact.

D.3 Teacher Acceptance of Student Behaviors and Responses

Definition: Teacher comments were considered as acceptance when they implied that a response was correct or a behavior was appropriate. Comments such as "OK," "uh-huh," and "yes," expressed in a matter of fact intonation were recorded in the acceptance category. Such comments did not include explicit praise or reinforcement, through either content of the statement, voice intonation or non verbal cues. Whenever a teacher did not make an explicit evaluation of student response, but instead continued with comments or questions that implied the response was accurate, these reactions were also coded in the accept category. Following are findings concerning the acceptance that teachers gave students concerning their intellectual comments and work, their conduct, their physical appearance and the appearance of written work, and all other student behaviors and characteristics.

Findings: As Table 3A indicates, acceptance occurred in all classrooms in all three observations. During Observation I acceptance occurred on the average of 46 times per observation. During Observation II acceptance occurred on the average of 42 times per observation; and during Observation III acceptance occurred on the average of 40 times per observation. Therefore, acceptance accounted for approximately 63% of all interactions in all conditions across three points in time.

Table 3A indicates that the average frequency of acceptance per observation was consistent over time within each condition. Problem-solving classrooms had a consistently higher number of acceptance interactions per observation (54, 49, 42). However, since problem-solving classrooms had more interactions per observation (see Table 1A) acceptance interactions continued to average about 63% of the teacher/student interactions. Also, even though the microteaching classrooms had a mean of 33, 31 and 34 interactions per observation, this constituted less than 50% of the interaction at each point in time.

The results of the multivariate analysis reported in Appendix B, Table 2 revealed a statistical significance in the number of acceptance interactions among the treatment conditions ($p \leq .0001$). The problem-solving intervention had on the average 13 more acceptance responses than the microteaching and eight more than the control condition.

A comparison of Tables 3A, 3B, and Table 2 in Appendix B does not indicate any significant treatment effect. However, some patterns do emerge. Acceptance was more equitably distributed between boys and girls than was praise (Table 3A). However, when inequity occurred, it was female students who received less teacher acceptance than expected. During Observation I both boys and girls in microteaching and problem-solving classrooms were getting almost exactly the amount of acceptance expected (less than 1% imbalance). In the control classrooms there was a slight imbalance (2%) in the distribution of acceptance among males and females in favor of the males. This 2% would translate into less than 10 interactions over a 6-hour school day. During

TABLE 3A: COMPARISON OF TEACHER ACCEPTANCE OF STUDENT BEHAVIORS AND RESPONSES IN THE MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1)	(2)	(3)	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
Condition	Number of Classrooms	Mean Interactions Per Observation	(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	54	0.2%	NA	NA
Microteaching	43	33	-0.8%	-0.2%	-3.0%
Control	35	39	2.0%	-4.0%**	-4.0%**
Test 1: Problem-solving vs. microteaching:				Z = 0.4918	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.1470	
OBSERVATION II					
Problem-Solving	22	49	0.9%	NA	NA
Microteaching	42	31	-2.0%	-1.0%	-1.0%
Control	29	34	0.7%	-3.0%**	-8.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.3418	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.6466	
OBSERVATION III					
Problem-Solving	23	42	3.0%	NA	NA
Microteaching	44	34	1.0%	-4.0%	3.0%
Control	30	39	5.0%	-4.0%**	-5.0%**
Test 1: Problem-solving vs. microteaching:				Z = 0.7958	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.7154	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

Observation II, although there was some shifting in the coefficient of distribution for boys and girls, acceptance was still distributed in an equitable manner. In Observation III, however, the inequity in the distribution of acceptance between boys and girls in control classrooms rose to 5%. This would translate to boys having 24 more acceptance interactions than expected during a 6-hour school day, and girls having 24 less. In Observation III, in the problem-solving classes there was an inequity of 3% in favor of boys. In Observation III microteaching classes were at virtual equity with only a 1% inequity in the distribution of acceptance.

Minority students appeared to receive less acceptance interactions than expected. However, except for Observation II control classrooms and Observation III microteaching classrooms, the difference between the treatment of minority boys and minority girls was very small. In the Observation II control classrooms minority girls received 8 fewer acceptance interactions for a difference of 5%. Microteaching observation classrooms were the only condition where minority students, in this case girls, received more acceptance interactions than their representation in the classroom population would lead one to expect.

Table 3A indicates that the small differences between the treatment groups was not statistically significant in any of the observations. Table 3B indicates that there were no significant differences found when analyzing the classroom as the unit of measure. While most classrooms did not have significant levels of bias (75% to 92.9%), when bias existed in control classrooms, it was much more likely to favor boys than girls. The microteaching classrooms which reflected bias were the fewest in number in Observations I and II, and tended to favor girls slightly. No clear pattern of bias was detected in the problem-solving groups other than the trend toward fewer classrooms with bias over time (Table 3B).

However, in the multivariate analysis (Appendix B, Table 2) the difference between the acceptance responses distributed to males and females approached marginal significance (.127), with males receiving a disproportionately higher number in the problem-solving condition when contrasted with microteaching.

Discussion: Acceptance of student comments, behaviors, and characteristics was the most frequent teacher reaction to student behaviors in every condition and at every point in time. It occurred in all classrooms and accounts for more interaction than praise, criticism, and remediation combined. These findings raise questions concerning the possible overuse of acceptance in the classrooms, particularly in intellectual areas where praise, remediation and criticism are responses likely to provide students with more precise feedback concerning the quality of their academic work (see the section on intellectual acceptance for more discussion of this issue). Based on the findings in this study, it appears that acceptance is the most equitably distributed type of interaction.

TABLE 3B: TEACHER ACCEPTANCE OF STUDENT BEHAVIORS AND RESPONSES IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	8.3%	75.0%	16.7%
Microteaching	43	11.6%	81.4%	7.0%
Control	34	5.9%	73.5%	20.6%
	CHI-SQUARE = 3.6041		P ≤ 0.4622	
OBSERVATION II				
Problem-Solving	22	13.6%	77.3%	9.1%
Microteaching	42	4.8%	92.9%	2.4%
Control	29	3.4%	86.2%	10.3%
	CHI-SQUARE = 4.7556		P ≤ 0.3133	
OBSERVATION III				
Problem-Solving	23	4.3%	87.0%	8.7%
Microteaching	44	11.4%	79.5%	9.1%
Control	30	0.0%	76.7%	23.3%
	CHI-SQUARE = 7.2656		P ≤ 0.1225	

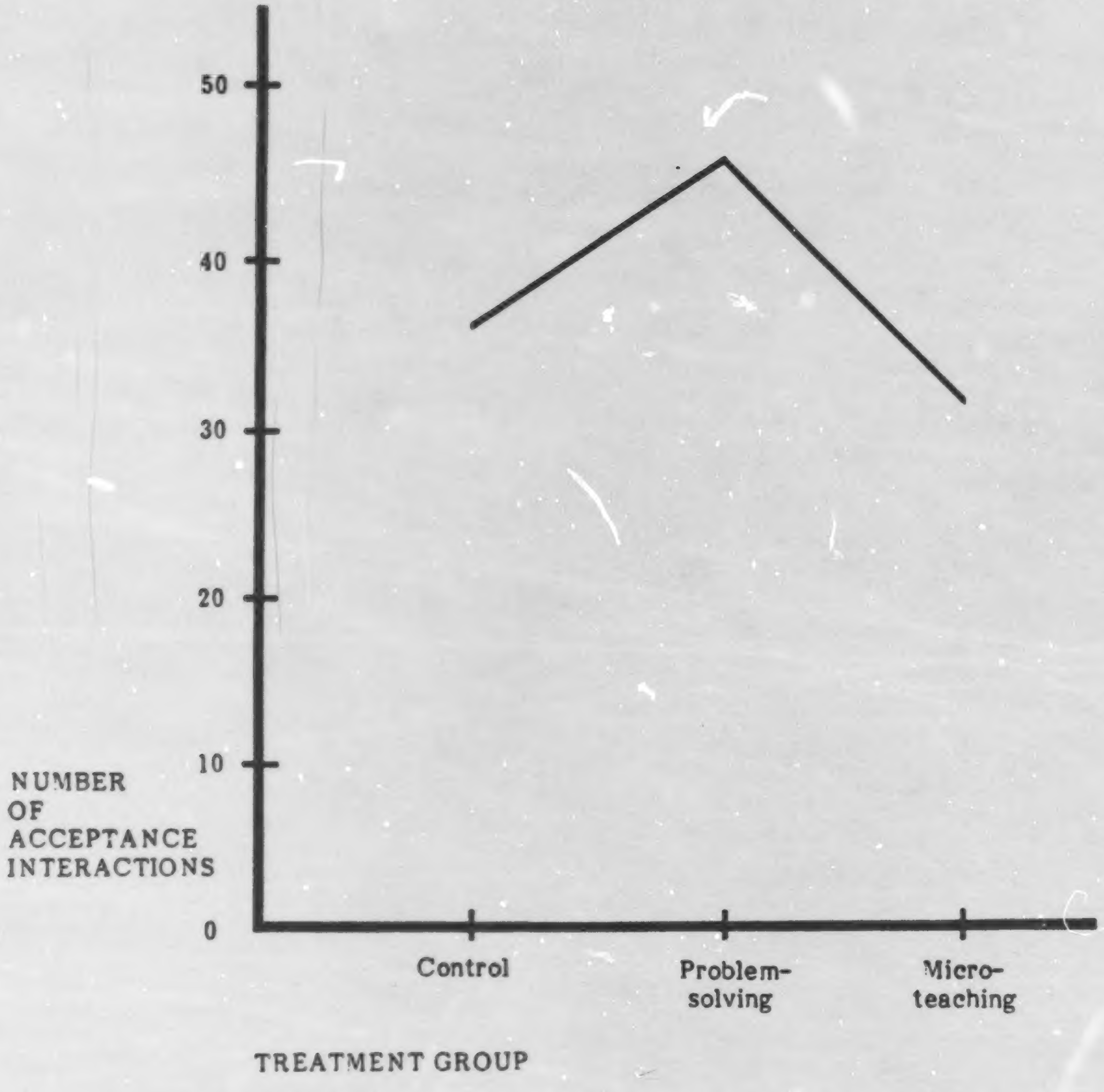
* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Although Tables 3A and 3B display no differences of statistical significance, Table 3B shows an interesting distribution of bias at the classroom level. In the control condition, while most of the classrooms did not reach significant levels of bias, when bias did appear it was three and four times more likely to favor the boys in the first two observations, and by Observation III, 23.3% of the biased control classrooms favored boys in the frequency of teacher acceptance, and none favored the girls. During this last observation, a male student in the control condition would never experience a classroom with significantly fewer acceptances directed at males. On the other hand, a female student would stand a one in four chance of being in a classroom where she would receive statistically significant fewer teacher acceptance interactions.

Another point worth mentioning concerns the microteaching condition. Not only were there consistently fewer classrooms with bias in this condition when compared to the control, but there was a slight tendency for female students to be favored in all three observations. In the problem-solving condition, the percentage of biased classrooms decreased over time. The classrooms with bias favoring boys went from 16.7% to 9.1% to 8.7%. Those favoring girls went from 8.3% to 13.6% to 4.3%. A female student would have a lower likelihood of encountering a classroom with a clear bias in favor of boys in either treatment condition than in the control condition.

Table 3A indicated that although acceptance was the most frequent teacher response, the frequency of this response differed markedly in the three conditions. This type of interaction appeared most often in the problem solving condition, and least frequently in the microteaching classrooms. If acceptance is viewed as the least precise and useful of the four forms of feedback, the microteaching condition not only reflected considerable equity in the distribution of this response, but also reduced its frequency (Figure 2). The problem-solving intervention did not effect the same result, and, in fact, acceptance was more frequent in this intervention than in the control condition. The microteaching condition may underscore the relationship between equity and effectiveness. As teachers attended to an equitable distribution of interactions, the types of interactions chosen by the teachers proved to be more precise and discrete, and the unfocused acceptance interaction was used less often.

Figure 2: AVERAGE NUMBER OF ACCEPTANCE INTERACTIONS PER CLASSROOM BY TREATMENT GROUP FOR OBSERVATION III



D.4 Teacher Remediation of Student Behaviors and Responses

Definition: Remediation interaction was coded each time a teacher's comment indicated that there was a deficiency in a student characteristic or behavior and that some corrective action should be taken. Comments considered remedial included: "If you wrote more neatly, you would make fewer errors;" "Please sit up;" "Next time, check the topic headings before you answer the questions." Remedial comments by the teacher indicated that the student behavior or performance was not acceptable, that a deficiency existed, and that corrective action was necessary. These teacher comments did not indicate an explicit negative evaluation or the imposition of penalties.

Findings: Remediation comments comprised the second most frequent classroom interaction, exceeded only by acceptance comments. Remediation occurred in 100% of the classes at all three points in time. During Observation I remediation occurred, on the average, 28 times per observation, encompassing 38% of the total interactions. During Observation II remediation occurred, on the average, 26 times per observation, encompassing 39% of the total interaction. During Observation III remediation occurred, on the average, 23 times per observation, encompassing 35% of the total interaction.

Table 4A displays statistics concerning the distribution of remediation across three points of time by condition. Although the average amount of interaction per observation decreased in each condition over time, the percentage of interaction that was remediation stayed fairly constant within each condition. In the microteaching classes, remediation accounted for 34.7% of all classroom interaction over the three observations. In the problem-solving treatment, remediation occurred at a slightly lower rate, averaging 28% of all interactions. In the control classes, remediation accounted for 33.3% of classroom interactions.

Table 3 in Appendix B reflects the results of the multivariate analysis in which the mean average of remedial interaction was 17.3 in the problem-solving, 20.72 in the control and 22.24 in the microteaching condition ($p \leq .081$) (Figure 3). This marginally significant difference underscored the higher rate of remediation in the microteaching condition and the lower rate in the problem-solving classrooms. This emerged statistically strongest in Observation III.

Figure 3: AVERAGE NUMBER OF REMEDIAL INTERACTIONS PER CLASSROOM BY TREATMENT GROUP FOR OBSERVATION III

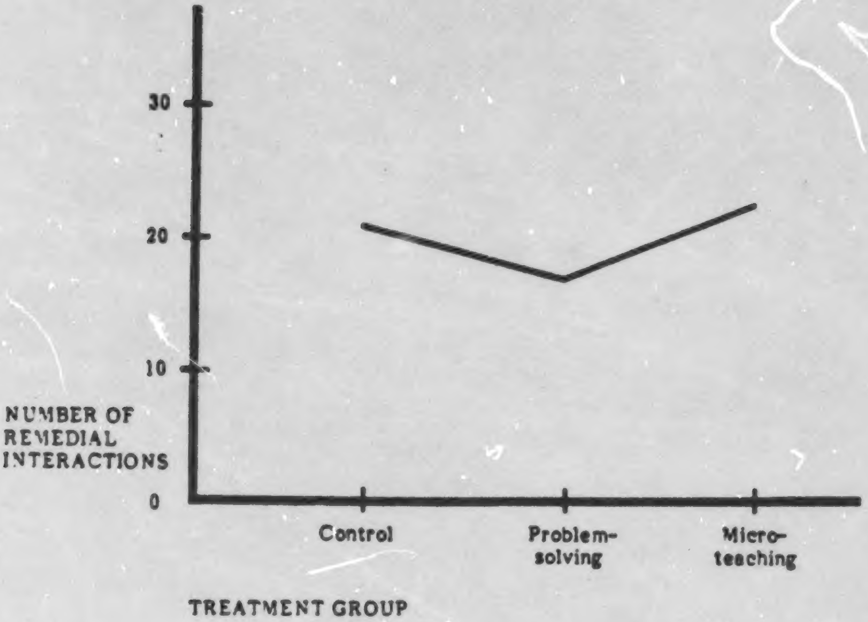
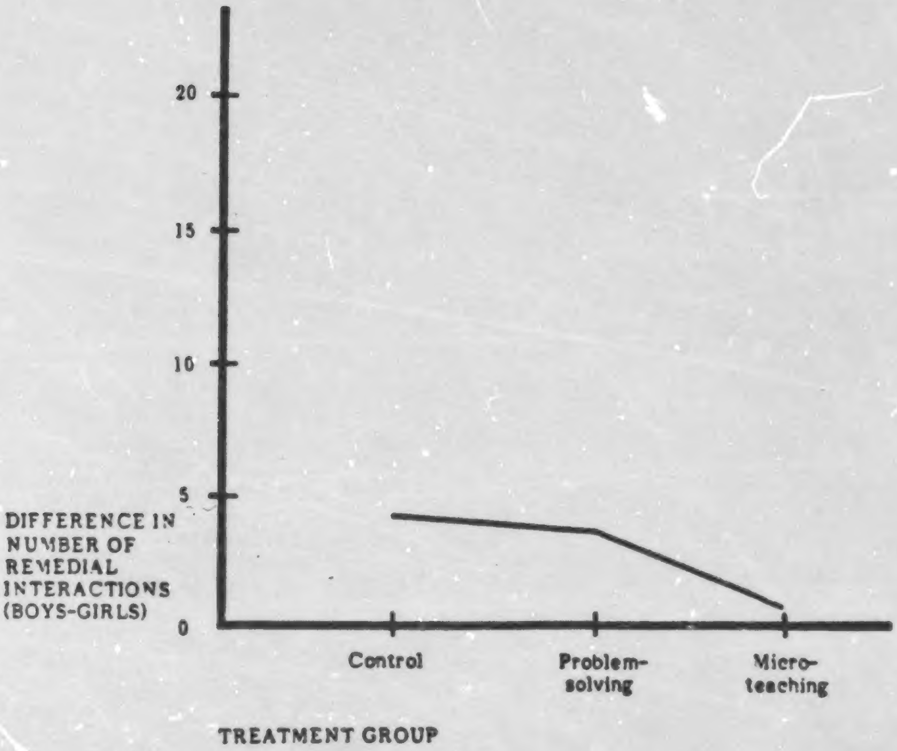


Figure 4: DIFFERENCE IN THE AVERAGE NUMBER OF REMEDIAL INTERACTIONS RECEIVED BY MALE AND FEMALE STUDENTS (BOYS-GIRLS) FOR OBSERVATION III



The univariate results for the difference measure (between males and females) across treatments indicate a marginally significant effect ($p \leq .097$). The amount of remediation was least equitable in the control condition and most equitable in the microteaching condition. The male students received more remedial interactions in the control (mean of 4.18) and problem-solving (3.83) classrooms, but male and female students were almost at equity in the microteaching classes (.44) (Figure 4).

In analyzing the distribution of remedial interactions over all three time periods, there were clear differences in the total number and distribution of these interactions (Figures 3 and 4).

During Observation I in microteaching classrooms, boys and girls received almost precisely the amount of remediation expected (.8%). However, in the problem-solving and control classrooms, girls received less remediation than expected and the boys received more. In the problem-solving classroom the 5% disparity means that, on the average, boys would receive approximately 16 more remedial interactions than expected, and girls would receive approximately 16 fewer remedial interactions than expected in an equitable 6-hour school day. The 11% disparity in control classrooms means that, on the average, boys were gettng approximately 29 more remedial interactions than expected, and girls 29 fewer remedial interactions than expected in a 6-hour school day.

In Observation II in all three conditions -- microteaching, problem-solving, and control -- girls received less remediation than expected and boys received more than expected (5%, 14%, and 8%, respectively). Although the distribution was closest to equity in the microteaching classes, and furthest from equity in the problem-solving condition, none of the conditions could be cited as at equity. However, by Observation III, the microteaching and problem-solving classrooms moved substantially closer to equity than had been the case in Observation II. In microteaching classrooms boys received 2% more remedial interactions than expected and the girls 2% fewer remedial interactions than expected. In problem-solving classrooms boys received 3% more remedial interactions than expected and girls 3% fewer remedial interactions than expected. In control classrooms, however, the disparity was greater than either at Observation I or Observation II. Here the 12% disparity meant that on the average boys were getting approximately 30 more remedial interactions than would be expected during an equitable 6-hour school day.

The data were not indicative of clear patterns concerning minority students. Nine of the 12 measures were negative values, indicating underrepresentation in remedial interactions. However, at least four of these 12 measures were close to equity. The microteaching condition was generally closer to an equitable distribution than was the control, with the greatest variation from equity occurring in the Observation II control (-10%).

Minority girls were always underrepresented in the control condition, and minority boys were close to equity in Observations I and III. By Observation III, the microteaching classes were closest to equity for minority students.

TABLE 4A: COMPARISON OF TEACHER REMEDIATION OF STUDENT BEHAVIORS AND RESPONSES IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
			(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	26	5.0%	NA	NA
Microteaching	43	26	0.8%	-0.1%	-5.0%
Control	34	22	11.0%	-1.0%**	-4.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.5693	
Test 2: Problem-solving & microteaching vs. control:				Z = -3.4167***	
OBSERVATION II					
Problem-Solving	24	19	14.0%	NA	NA
Microteaching	42	22	5.0%	- 4.0%	3.0%
Control	29	22	8.0%	-10.0%**	-7.0%**
Test 1: Problem-solving vs. microteaching:				Z = 3.0003***	
Test 2: Problem-solving & microteaching vs. control:				Z = 0.5164	
OBSERVATION III					
Problem-Solving	23	16	3.0%	NA	NA
Microteaching	44	23	2.0%	-2.0%	0.2%
Control	30	21	12.0%	3.0%**	-6.0%**
Test 1: Problem-solving vs. microteaching:				Z = 0.4782	
Test 2: Problem-solving & microteaching vs. control:				Z = -3.7192***	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

Table 4A indicates statistically significant differences were found between three conditions at all three observations. In Observations I and III, statistically significant differences emerged between the treatment conditions with Z = 3.4169 and the control condition at Z = 3.7192. The distribution of remedial interactions was significantly more equitable in the treatment conditions than in the control in these observations. In Observation II, the microteaching condition reflected a significantly greater level of equity when compared to the problem-solving treatment.

Table 4B, which used the classroom as the unit of analysis, did not reveal similar significant differences. However, several interesting findings do emerge. The majority of classes (68.2% to 93%) did not have significant levels of bias. The microteaching condition had the lowest percentage of biased classrooms, with a mean of 3.9% of classrooms with a bias toward females and 10.8% of the classrooms with a greater frequency of remedial interactions directed at males. The control group contained an average of only 2.1% of the classrooms with a higher number of remedial interactions directed at females, but 25.1% of classrooms with more remedial interactions directed at males. The problem-solving condition contained an average of 21.9% of classrooms with males receiving more remediations than expected, and 2.8% of classrooms with females receiving more remediation than expected. While boys received more remedial comments in approximately one out of four control classrooms and one out of every five problem-solving classrooms, more remedial interaction involving males was present in only one out of every 10 microteaching classes. For females, the chances of receiving a greater proportion of remedial interaction averaged between only 2% and 4% in all three conditions.

Discussion: Remedial teacher comments appear to be important interactions in the classroom. They represent the most frequent active teacher intervention in the learning process; they are designed to improve academic performance, classroom conduct, appearance, and other student characteristics and behaviors. The high frequency of remedial comments underscored the reliance teachers placed on this type of interaction. All of the classrooms observed (N = 292 for the obervations) included remedial interactions, and included them at a relatively high rate, averaging 37.3% of all classroom interaction.

In the control classrooms, girls consistently received fewer remedial interactions than expected. The microteaching training was the more powerful treatment in promoting an equitable distribution of remedial comments by the teacher (.3%, 5%, 2%). By Observation III, both treatment conditions (microteaching 2%, problem-solving 3%) were closer to equity than the control classrooms (12%). It appears that the tendency of teachers to give boys more than their equitable share of remediation is a strong one. Observation II was the only observation not preceded by an intervention activity, and both treatments had their poorest showing at that point (5%, 14%). It may be that a stronger and more continuous treatment was required to counter the tendency to correct boys' efforts more frequently than expected. In all three observations in all three conditions, girls received fewer remedial interactions than expected. The treatment classrooms, especially the microteaching intervention, had significant success in inhibiting this inequity, but not in eliminating it.

TABLE 4B: TEACHER REMEDIATION OF STUDENT BEHAVIORS AND RESPONSES IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1) Condition	(2) Number of Classrooms	Percentage of Classrooms Which* (3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	4.2%	75.0%	20.8%
Microteaching	43	2.3%	93.0%	4.7%
Control	34	2.9%	79.4%	17.6%
	CHI-SQUARE = 4.9496		$P \leq 0.2925$	
OBSERVATION II				
Problem-Solving	22	0.0%	68.2%	31.8%
Microteaching	42	7.1%	81.0%	11.9%
Control	29	3.4%	65.5%	31.0%
	CHI-SQUARE = 6.3080		$P \leq 0.1773$	
OBSERVATION III				
Problem-Solving	23	4.3%	82.6%	13.0%
Microteaching	44	2.3%	81.8%	15.9%
Control	30	0.0%	73.3%	26.7%
	CHI-SQUARE = 3.0186		$P \leq 0.5547$	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

It is also evident from Table 4A that not only was the distribution closest to equity in the microteaching condition, but remediation was also used more frequently in this condition. The multivariate analysis served to underscore the relative effectiveness of the microteaching intervention in which marginal levels of significance were found in both the frequency and distribution of remedial interactions.

The effectiveness of the treatment groups generally, and the microteaching group in particular was statistically significant when compared to the control group most clearly at Observation III. (See Tables 4A, 4B, and Appendix B, Table 3.) Remedial interactions are important teacher behaviors, underscored in the research on effective schools and effective teaching. While even in the treatment conditions the boys received a greater frequency of remedial interactions than the girls, the discrepancy was significantly less than in the control during Observations I and III. Further research would be useful in determining whether stronger treatments -- in time, intensity or methodology -- could achieve even higher levels of equity in this area. Additionally, it would be useful to investigate the behaviors which initiate remedial interactions. For example, are the interactions initiated primarily by students or teachers? Are the length and nature of remedial teacher comments affected by the sex of the student? It is interesting to consider why so many classrooms are not marked by such bias, as indicated on Table 4B, but when classrooms are characterized by an inequitable coefficient of distribution, they are measured at statistically significant levels of magnitude, as reported in Table 4A.

It is clear that remedial teacher interactions represent a central behavior in the teaching - learning process. It is a far more proactive behavior than the acceptance interaction, which by itself characterizes the majority of classroom interactions. Remediation is related to monitoring and feedback activities discussed in the literature on effective schools and effective teaching. From the data presented here, boys receive more than their equitable share of this interaction. The treatment conditions have significantly reduced, but not eliminated, this bias.

D.5 Teacher Criticism of Student Behaviors and Responses

Definition: The criticism category included all classroom interactions in which the teacher gave students explicit (rather than implied) disapproval concerning their intellectual comments and work, their conduct, their physical appearance, and all other characteristics and behaviors. Criticism goes beyond remediation in indicating negative teacher evaluation and at times it involves the imposition of warnings and penalties. Comments such as "That answer is incorrect," "Your paper is sloppy," and "If you keep up this kind of behavior, you'll stay after school," were coded in the criticism category. Furthermore, comments such as "Don't talk during the test" or "Rewrite this paper" (which, based on content, would be coded in the remediation category) were considered as criticism if they were delivered with harsh voice intonation and/or accompanied by very negative non verbal expression and gestures.

Findings: Criticism occurred in the fewest number of classrooms and with less frequency than any other form of teacher reaction. During Observation I, criticism occurred in 37% of the classes on the average of 5 times per observation. It constituted 7% of the total classroom interaction. During

Observation II, criticism occurred in 43% of the classes, on the average of 3 times per observation. It constituted 5% of the total interaction. During Observation III, criticism occurred in 29% of the classes on the average of three times per class. It constituted 5% of the total interaction.

Table 5A displays limited data available concerning the distribution of criticism of students by teachers among conditions and over time. In Observations I and II, critcism occurred in approximately half of the microteaching classrooms and constituted approximately 5% of the total interaction in those classrooms where it occurred. During Observation III, criticism occurred in approximately one third of the microteaching classrooms and constituted 4% of the total interaction. Over all three observations, criticism was 5% of total interaction in slightly less than half of the microteaching classrooms.

Criticism occurred at a somewhat similar rate and frequency in the control classrooms. In Observation I, criticism occurred in 40% of the classrooms and constituted 5% of the total interactions. In Observation III, criticism was 5% of total interaction in one-third of the control classrooms; there was no criticism tallied for the remaining two-thirds of the control classrooms. Over the three points in time, criticism occurred in 39% of the control classrooms and constituted approximately 6% of the total interaction.

Criticism occurred much less frequently in the problem-solving classrooms than in either of the other two groups. In Observation I it occurred in 13% of the classrooms, and it constituted 6% of the total interaction. In Observation II, it occurred in 22% of the classrooms and constituted 7% of the total interaction. In Observation III, it occurred in 17% of the classrooms and constituted 5% of the interaction. Over the three points in time, criticism occurred on the average in 17% of the problem-solving classrooms, and it constituted 7% of total interaction in those classrooms.

In terms of the distribution of criticism between girls and boys, Table 5A indicates that girls received less criticism than expected and boys received more criticism than expected, regardless of condition or point in time. In Observation I, in the microteaching intervention, there was an equitable distribution (1% disparity which is less than 1 interaction per day). However, distribution of criticism became increasing less equitable and deteriorated to a 26% disparity in Observation III.

In the control classes, boys received an increasing amount of criticism over time (a 7% disparity in Observation I, a 17% disparity in Observation II, and a 28% disparity in Observation III). In other words, by Observation III in both the microteaching classes and the control classes girls would receive 10 fewer critical reactions than would be expected by their representation in the classroom during an average 6-hour school day.

There was a much greater imbalance in the distribution of criticism in the problem-solving classes with boys receiving a greater amount of this reaction at all points in time. The disparity was 49% in Observation I, 23% in Observation II, and 46% in Observation III.

TABLE 5A: COMPARISON OF TEACHER CRITICISM OF STUDENT BEHAVIORS AND RESPONSES IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
			(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	3	NA	49.0%	NA	NA
Microteaching	21	4	1.0%	7.0%	-6.0%
Control	14	5	7.0%	2.0%**	-9.0%
Test 1: Problem-solving vs. microteaching:					Z = ******
Test 2: Problem-solving & microteaching vs. control:					Z = *******
OBSERVATION II					
Problem-Solving	5	NA	23.0%	NA	NA
Microteaching	21	3	10.0%	3.0%	-14.0%
Control	13	3	17.0%	12.0%**	-11.0%**
Test 1: Problem-solving vs. microteaching:					Z = 2.6750***
Test 2: Problem-solving & microteaching vs. control:					Z = 0.0475
OBSERVATION III					
Problem-Solving	4	NA	46.0%	NA	NA
Microteaching	14	3	26.0%	2.0%	- 8.0%
Control	10	3	28.0%	1.0%**	-21.0%**
Test 1: Problem-solving vs. microteaching:					Z = ******
Test 2: Problem-solving & microteaching vs. control:					Z = ******

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

Some consistent patterns emerged in the distribution of criticism to minority girls and boys. Minority boys received more criticism than expected and minority girls received less criticism than expected based on their representation in the classroom population. These patterns hold regardless of condition or point in time.

Statistical significance tests revealed that at Observation II, the difference in the distribution coefficient of problem-solving and control classrooms was significant, with problem-solving reflecting a higher degree of bias. However, with an N = 5 for problem-solving, no generalizations can be advanced.

About one in four of the problem-solving classes had a coefficient of distribution which was statistically significant at the classroom level (Table 5B) and this always reflected more criticism interaction involving boys. With the exception of Observation I in the control group, when the classroom unit reached statistically significant levels of bias, it was the boys who were receiving the criticism.

Discussion: The findings show that teacher criticism of student behaviors and responses was used less frequently than praise, acceptance or remediation. In approximately two out of three classrooms, teachers did not give students any criticism whatsoever. In those one out of three classrooms where criticism of students did occur, it happened on the average of 4 times per observation.

Clearly, criticism is a negative reaction that may have a powerful effect on students. Consequently, it should not be used inappropriately. However, given the findings in this study, one can question whether it is a response used too infrequently in classrooms. (See intellectual criticism for further discussion of this issue.)

The low incidence of criticism attenuated the import of statistical significance. However, none of the three conditions maintained equity over time. Although the microteaching condition began at virtual equity in Observation I, by Observations II and III there were large disparities with boys receiving far more criticism than girls. Since the third observation took place during January and February, one can only question whether the imbalance would become even greater as the school year continued. It is also important to consider the impact of criticism on student achievement and behavior. Does criticism generally have a negative impact on students or does it provide guidelines and standards by which students judge themselves, set new goals, and work toward improvement?

The low frequency of criticism in the problem-solving classrooms especially, and in all conditions generally, caused an inordinately high coefficient of distribution in several cases. However, clearly criticisms are being directed at male students far more frequently than expected in all conditions and at all observations.

D.6 Intellectual Interactions

Definition: An intellectual interaction is defined as an exchange in which a teacher responds to a student's intellectual comment or academic work. Interaction coded in the intellectual categories of the INTERSECT observation instrument was focused on the intellectual quality of a student's answer or work. It included student intellectual performance on tests and papers and

TABLE 5B: TEACHER CRITICISM OF STUDENT BEHAVIORS AND RESPONSES IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	3	0.0%	66.7%	33.3%
Microteaching	20	0.0%	90.0%	10.0%
Control	14	7.1%	92.9%	0.0%
	CHI-SQUARE = 5.4139		P ≤ 0.2474	
OBSERVATION II				
Problem-Solving	4	0.0%	75.0%	25.0%
Microteaching	18	0.0%	94.4%	5.6%
Control	12	0.0%	100.0%	0.0%
	CHI-SQUARE = 3.3941		P ≤ 0.1832	
OBSERVATION III				
Problem-Solving	4	0.0%	75.0%	25.0%
Microteaching	14	0.0%	100.0%	0.0%
Control	10	0.0%	90.0%	10.0%
	CHI-SQUARE = 3.1231		P ≤ 0.2098	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

the intellectual content of student verbal answers in classroom discussion. It usually did not pertain to student work in terms of following the rules of form concerning margins, headings, and appearance. All intellectual interaction was coded in the praise, accept, remediate or criticize categories of the INTERSECT observation system.

Findings: All classrooms in all conditions at all time periods contained intellectual interactions. In fact, the vast majority of classroom interactions were coded in the intellectual category. In Observation I, 65 out of 73 interactions (89%) were intellectually related. In Observation II, 58 out of 66 interactions (87%) were intellectual, and in Observation III, 55 of the 65 interactions (84%) were in the intellectual category. The data indicate that most interactions in all classrooms were intellectual in nature and that this finding was very consistent over time.

Slight variations did appear among the three conditions over time. Although the overall percentage of intellectual interactions decreased over time (89%, 87%, 84%), the microteaching intervention reflected a small rise in the percentage of intellectual interactions, increasing from 79% to 80% to 84%. The problem-solving condition did not reflect a clear trend (82%, 75%, 77%) while the control classrooms had a rather constant but slightly lower percentage of intellectual interactions than either treatment (73%, 75%, 72%). It may be of interest to note that by Observation III, the percentage of intellectual interactions in the microteaching classrooms exceeded those in the control classrooms by 12%, while the number of intellectual interactions in the problem-solving condition exceeded the control classes by 5%.

Clear differences emerged between the quantity of intellectual interactions involving girls and boys in the various conditions (see Table 6A). In the control situations, boys received more intellectual interaction than expected and girls less than expected. Moreover, this difference increased with time (3%, 4%, 8%). In the problem-solving condition, boys also received more intellectual interactions than expected, although this difference was virtually eliminated by Observation III (2%, 3%, .4%). In the microteaching classrooms, several interesting findings emerged. The data from the microteaching classes indicate that they began with almost perfect equity (.3%), and, in fact, reached perfect equity by Observation III (0%). At Observation II, there was a one percent deviation from equity, which was both slight and in favor of girls. That is, the Observation II microteaching condition was the only condition in which girls had a slight advantage over boys in the number or intellectual interactions. Both treatments deteriorated slightly at Observation II but reached virtual equity by Observation III, while the control classes continued to deteriorate and become increasingly less equitable with time.

The univariate analysis (Table 4, Appendix B) reflected statistically significant differences among treatment conditions. There was more intellectual interaction in fourth and sixth grade than in eighth (Figure 4). Both treatments increased the volume of intellectual interactions over the control group (Figure 4). And both treatments distributed this greater volume of interactions more equitably than the control condition. Of all three conditions, the microteaching classes were the most equitable (Figure 4).

An analysis of Tables 6A, 6B, and Appendix B, Table 4 emphasizes that by Observation III, there was clearly a more equitable coefficient of distribution in the treatment conditions than the control. Moreover, statistical tests using all three approaches support this difference.

Minority students, numerous enough only in the microteaching treatment and control conditions to be analyzed, generally received fewer intellectual interactions than expected. As Table 6A indicates, this was true in all times and both conditions with the exception of minority boys in the control group Observation II and minority girls in the microteaching group during Observation III. One finding that emerged in the microteaching condition was that minority males were near equity in terms of intellectual interactions during Observations I and II, but received fewer interactions during Observation III (-.8%, -1%, -5%). On the other hand, in the microteaching condition, minority girls received a greater number of intellectual interactions over time, approaching equity in both Observations II and III (-4%, -.8%, 1%). The microteaching intervention reflected a positive movement or trend toward equity for minority females.

In the control condition, minority girls always received fewer intellectual interactions than their representation in the classroom population would lead one to expect (-1%, -8%, -5%). For minority males in the control condition, no clear pattern emerged. Minority males started and ended with fewer intellectual interactions than their representation, but this situation improved in Observation II (13%, 3%, -2%). Generally, minority students were involved in fewer intellectual interactions than majority students.

The data concerning minority males are far less consistent. In two of the three observations in the control group, minority males were underrepresented, but in Observation II they received a greater number of intellectual interactions than their representation in the classroom would lead one to expect. Although in the microteaching condition minority males were near equity in Observations I and II, this situation deteriorated in Observation III. The microteaching condition did not provide a clear trend toward equity for minority males. Of course, at the onset of this project, the underrepresentation of minorities in intellectual interactions was not a target for treatment; the fact that minority female participation increased in the microteaching condition is encouraging. The results of this initial analysis of minorities and intellectual interactions suggest the need for a larger sample, further analysis, and the need to explore strategies to increase the participation of minority males as well as minority females in classroom intellectual interaction.

Table 6A indicates that by Observation III, there were statistically significant differences in the coefficient of distribution across conditions (Z = 4.5438). Distribution of intellectual interactions was at virtual equity in the microteaching condition and at .04% in the problem-solving group; these two treatments, when compared to the control condition at 8%, reflected statistically significant differences. A marginal level of significance was recorded at Observation II (Z = 2.6012) when comparing the coefficient of distribution for the microteaching condition (-1%) to that of the problem-solving condition (4%). These levels of significance follow a similar pattern for total interactions and remedial interactions, in which microteaching was significantly more equitable than problem-solving in Observation II. Problem-solving and microteaching, the two treatments, were statistically more effective than the control by Observation III.

TABLE 6A: COMPARISON OF TEACHER INTERACTIONS WITH STUDENTS CONCERNING INTELLECTUAL RESPONSE AND WORK IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	70	2.0%	NA	NA
Microteaching	43	58	0.3%	-0.8%	-4.0%
Control	35	49	3.0%	-3.0%**	-1.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.1317	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.8340	
OBSERVATION II					
Problem-Solving	22	54	3.0%	NA	NA
Microteaching	42	52	-1.0%	-1.0%	-0.8%
Control	29	48	4.0%	-3.0%**	-8.0%**
Test 1: Problem-solving vs. microteaching:				Z = 2.6012***	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.7306	
OBSERVATION III					
Problem-Solving	23	46	0.4%	NA	NA
Microteaching	44	57	0.0%	-5.0%	1.0%
Control	30	46	8.0%	-2.0%**	-5.0%**
Test 1: Problem-solving vs. microteaching:				Z = 0.2235	
Test 2: Problem-solving & microteaching vs. control:				Z = -4.5438***	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

TABLE 6B: TEACHER INTERACTIONS WITH STUDENTS CONCERNING INTELLECTUAL RESPONSE AND WORK IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1) Condition	(2) Number of Classrooms	Percentage of Classrooms Which* (3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	12.5%	66.7%	20.8%
Microteaching	43	9.3%	86.0%	4.7%
Control	34	5.9%	73.5%	20.6%
	CHI-SQUARE = 6.1272		$P \leq 0.1898$	
OBSERVATION II				
Problem-Solving	22	18.2%	68.2%	13.6%
Microteaching	42	14.3%	83.3%	2.4%
Control	29	7.1%	78.6%	14.3%
	CHI-SQUARE = 5.2162		$P \leq 0.2658$	
OBSERVATION III				
Problem-Solving	23	8.7%	82.6%	8.7%
Microteaching	44	9.1%	70.0%	15.9%
Control	30	0.0%	70.0%	30.0%
	CHI-SQUARE = 6.4546		$P \leq 0.1677$	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Although statistically significant differences between conditions were not found at the classroom level, interesting patterns did emerge within conditions. In the control condition, one out of every four classrooms had a statistically significant level of bias. During the three observation periods, an average of 21.6% of the control classrooms reflected a bias toward boys, but an average of only 4.3% favored girls. In fact, by Observation III, 30% of the biased classrooms were awarding males significantly more intellectual interactions, and none were favoring females in this category. Both treatment groups displayed no such pattern, and varied in the distribution of the number of classrooms reflecting bias; sometimes a greater percentage of classrooms demonstrated a bias toward boys, and at other times a greater percentage reflected a bias in the direction of girls. In the problem-solving condition, for instance, approximately one in four classrooms reflected statistically significant levels of bias. But this averaged 14.4% with a bias toward boys, and 13.1% with a bias toward girls. In the microteaching treatment, one out of five classrooms were characterized by a statistically significant level of bias in intellectual interactions, with an average of 7.7% of the classrooms providing more of these interactions to males and with an average of 10.9% of the classrooms providing more of these interactions to females.

Discussion: The data reveal that, on the average, three out of every four teacher-student interactions were concerned with intellectual and academic issues. In 100% of the classes observed in this study, the primary focus of classroom life was the acquisition of skills, concepts, and information. This emphasis on intellectual teacher-student interaction occurred in all conditions, in all geographic locations, and during all three of the observations.

The problem-solving and microteaching classes averaged a greater number of intellectual interactions than the control classes; however, only the microteaching classes maintained and increased this difference over time. Although a major focus of both interventions was to promote a more equitable distribution of the teacher's time and attention to all students, the experimental classes also reflected an overall greater focus on intellectual interaction. One, but not the only, explanation for this is that as teachers became more aware of classroom interaction, they were more likely to increase that interaction in terms of academic goals. This interpretation is certainly reinforced by an analysis of the data from the multivariate analysis. The univariate analysis also revealed a treatment effect in the total number of intellectual interactions. Both interventions had more intellectual interactions than the control (Figure 5). Multivariate analyses also indicated a difference in the average number of intellectual interactions by grade level with eighth grade having significantly less intellectual interactions (Figure 6). It is possible that when teachers become more "intentional" in ensuring that all students, both girls and boys, were involved in achieving academic goals, they also increased the overall frequency of intellectual interaction.

Figure 5: AVERAGE NUMBER OF INTELLECTUAL INTERACTIONS PER CLASSROOM BY TREATMENT GROUP FOR OBSERVATION III

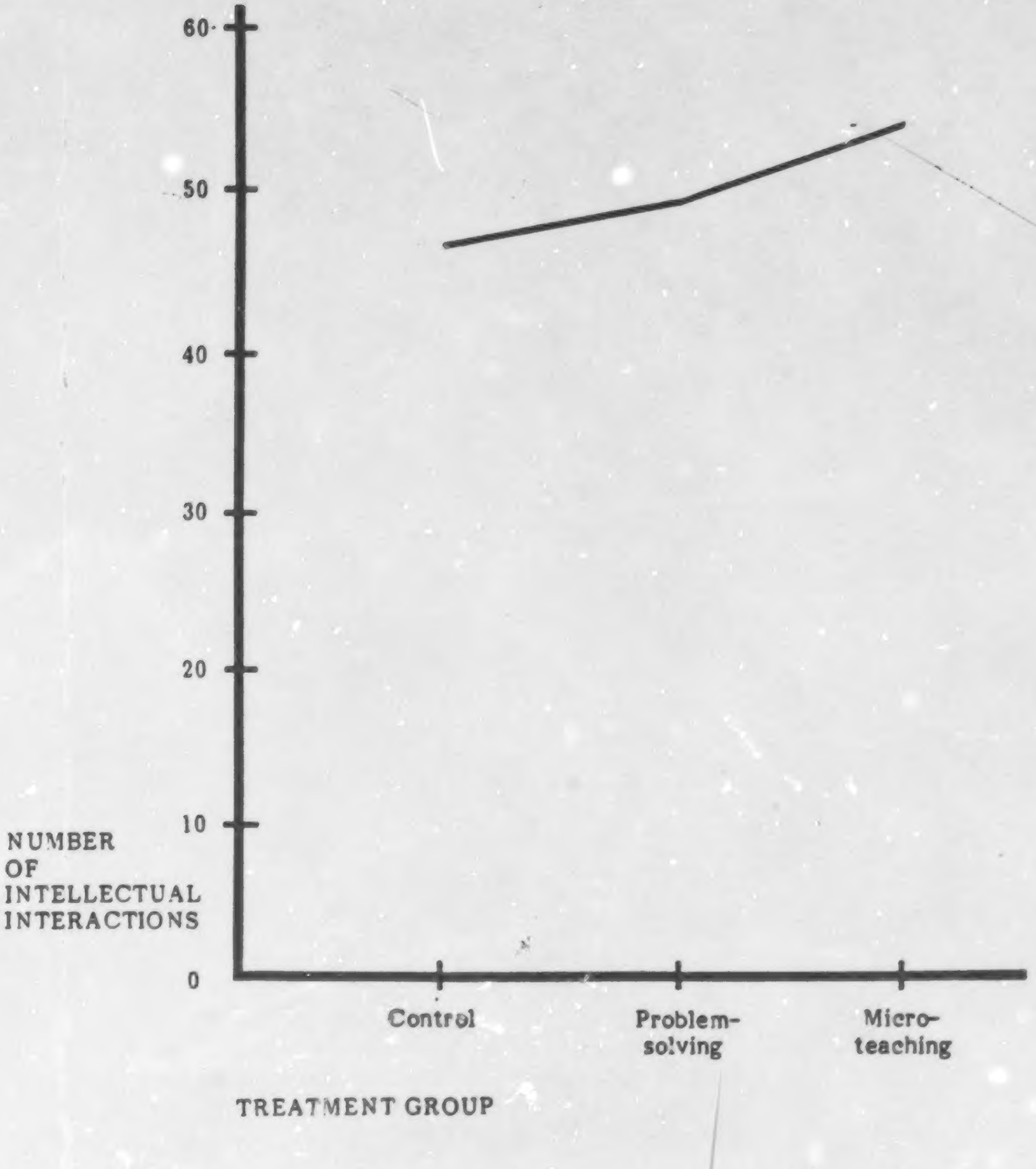
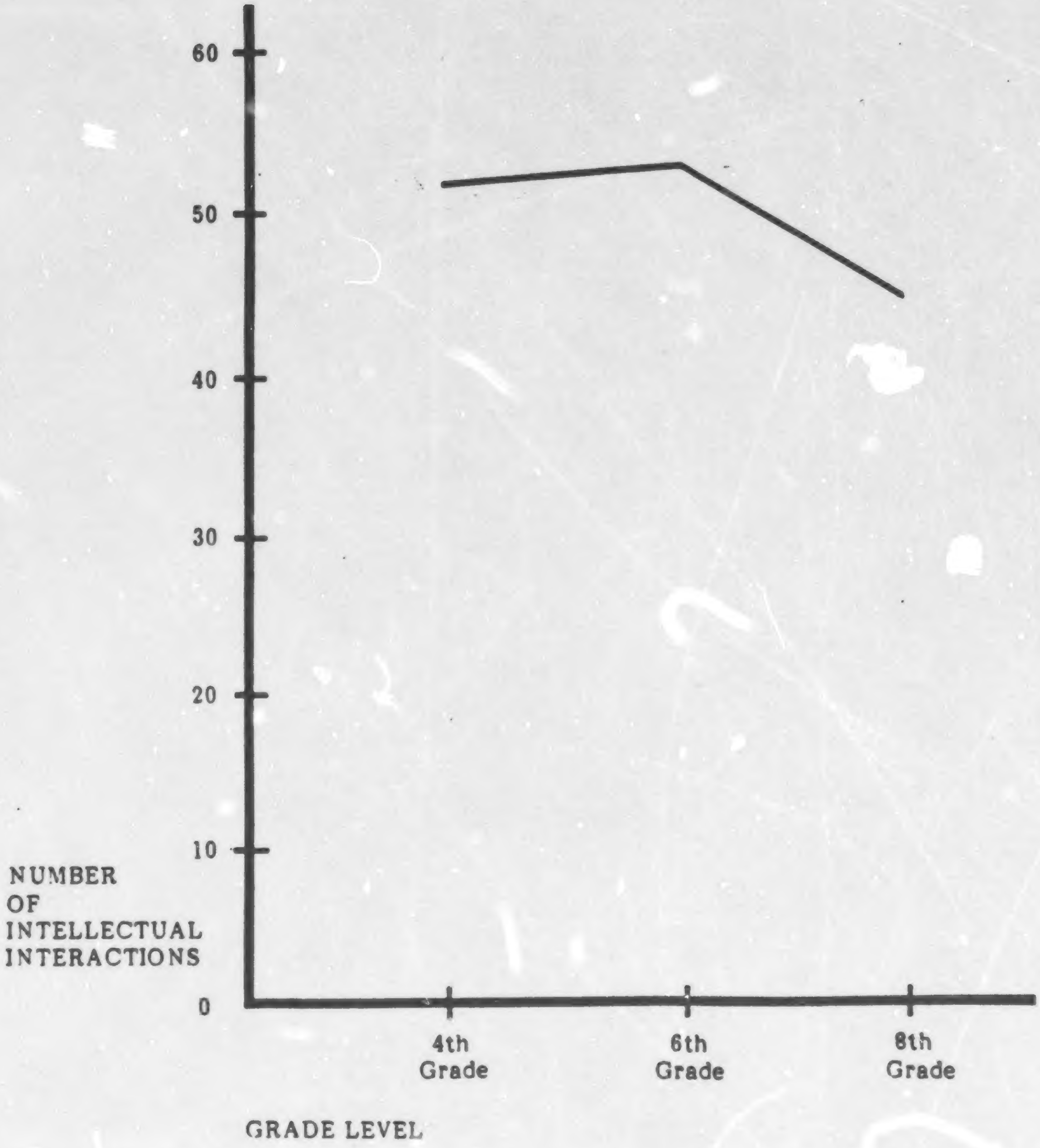
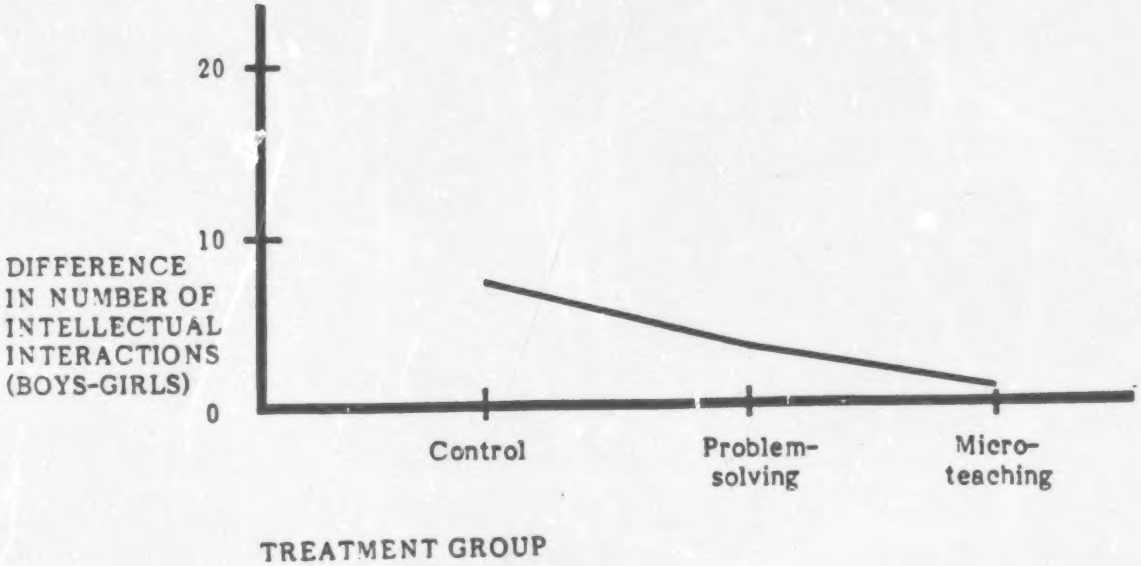


Figure 6: AVERAGE NUMBER OF INTELLECTUAL INTERACTIONS PER CLASSROOM BY GRADE LEVEL FOR OBSERVATION III



When one considers the distribution of intellectual interactions, it is clear that in the control classrooms boys received a greater number of these interactions than girls, and that this difference increased over time. The third observation, which occurred in January and February, reflected the greatest disparity in intellectual attention involving male and female students, and it is interesting to hypothesize whether or not this gap would widen even further late in the year. The uneven distribution which characterized the control groups contrasts sharply with the treatment groups. During the three observations of the microteaching and problem-solvng groups, five of the six measurements reported a difference of 2% or less between the distribution of intellectual interactions involving boys and girls, four of these measurements reported differences of 1% or less (virtual equity). In all three observations the microteaching condition showed a 1% or less difference and culminated in perfect equity (0%). It is clear that not only was the disproportionately higher number of these interactions with boys reduced in the treatment conditions, but the trend evident in the control group of an increasingly disproportionate distribution over time was also effectively countered. In the final observation, when the control classes reflected their greatest disparity, the treatment groups had achieved their greatest degree of equity (Figure 7).

Figure 7: DIFFERENCE IN THE AVERAGE NUMBER
OF INTELLECTUAL INTERACTIONS RECEIVED
BY MALE AND FEMALE STUDENTS (BOYS-GIRLS)
PER CLASSROOM BY TREATMENT GROUP
FOR OBSERVATION III



A comprehensive analysis of the results concerning minority students is hampered by the smaller number of classes with minority students available for analysis. However, some general findings and trends do emerge. For example, both minority boys and girls generally received fewer intellectual interactions than expected in terms of their representation in both the control and treatment classes. However, minority females were particularly underrepresented in intellectual interactions in the control classes, while the microteaching treatment reflected a clear trend toward involving minority females in proportion to their enrollment. In this respect, minority females, like females in general, received the most disproportionate number of intellectual interactions in the control condition and the most equitable number of intellectual interactions in the microteaching condition.

Time proved to be a significant factor once again when comparing the two treatment groups to the control group. While the treatment groups attained virtual equity by Observation III, the control group registered its poorest coefficient of distribution, and, as Table 6A indicates, the differences were significant. Table 6A also reveals that microteaching regularly attained a more equitable distribution coefficient than the problem-solving treatment, reaching statistical significance during Observation II.

Table 6B indicates that approximately one in every four control and problem-solving classrooms had a statistically significant level of bias as measured by the coefficient of distribution. The microteaching condition averaged one in every five classes with statistically significant levels of bias. However, while the problem-solving condition was improving over time, the microteaching condition was deterioriating and gaining a higher percentage of biased classrooms over time.

Table 6B also reveals that the direction of the bias in these classrooms differs dramatically between the treatment group and the control group. In the treatment condition a female student entering a biased treatment classroom would stand about the same odds of entering a class with girls receiving more intellectual interactions than expected as one in which boys were receiving more of these interactions than expected. In the control condition, however, she whould be approximately five times more likely to enter a class with bias favoring boys as one with bias favoring girls.

D.7 Teacher Praise of Student Intellectual Response and Work

Definition: Intellectual praise refers to those classroom interactions in which the teacher offers positive reinforcement of the quality of a student's idea, response or other academic performance. The interactions in which teachers verbally rewarded student demonstrations of cognitive accomplishment were recorded in this category, and ranged from praise of the quality of a students's idea to a student's successful completion of a school project, from a high test score to a particularly strong answer during a class discussion.

Praise was defined broadly to include both verbal content and voice intonation. Comments such as "Excellent answer." "That's exactly right," and "Great improvement in your paper," were all included as intellectual praise. But so was "O.K.!," if it was spoken with very positive tone and intonation.

Findings: Approximately four out of five classrooms observed in this study contained teacher praise for student intellectual comments. Praise for student intellectual comments averaged between 11% and 14% of the total interaction. In Observation I, 84% of the classes observed (86 of 102 classes) contained intellectual praise, averaging eight such interactions per class. Observation II data indicated that 80% of the classes (74 of 93 classes) contained an average of nine intellectual praise interactions. In Observation III, 80% of the classes (78 of 97 classes) contained intellectual praise averaging eight such interactions per observation. These findings underscored the constancy of intellectual praise over time.

This consistency is also displayed in the percentage of intellectual praise interactions when compared to all intellectual, all praise, and total class interactions. When viewed over time, intellectual praise accounted for 11% (Observation I), 14% (Observation II), and 12% (Observation III) of total classroom interactions. When compared to intellectual interactions generally, intellectual praise accounted for a similarly small percentage: 12% (Observation I), 16% (Observation II) and 15% (Observation III). When compared to praise in general, a different picture emerged as intellectual praise accounted for 89% of all praise in Observation I, and 100% in Observations II and III. Intellectual praise, therefore, represented a relatively small percentage of total and intellectual interactions, but it comprised almost all of the praise given in the classroom.

An analysis of the frequency of intellectual praise among the treatment and control classes revealed substantial differences (see Table 7A). In all three time periods, the microteaching classes contained an average of eleven intellectual praise interactions (15% at Observation I, 17% at Observation II, and 16% at Observation III), considerably more than either of the other conditions and equal to no greater than both the control and problem-solving conditions combined. The control classes were also rather consistent over time, averaging six (9%), eight (13%) and six (9%) intellectual praise interactions. The problem-solving intervention averaged the lowest number of intellectual praise interactions per class, five (6%), three (4%) and three (5%).

The three conditions also differed in the number of classes which contained intellectual praise. The vast majority of microteaching classes contained these interactions: 95% (Observation I), 93% (Observation II), and 93% (Observation III). Far fewer classes in the control and problem-solving treatment, the figures were 79% (Observation I), 59% (Observation II), and 70% (Observation III). For the control classes, the percentages were 74% (Observation I), 76% (Observation II), and 70% (Observation III). Approximately three out of four classes in the problem-solving and control conditions contained intellectual praise. Almost all of the microteaching classes contained intellectual praise. An observer would be more likely to see intellectual praise, and to see it more frequently, in the microteaching condition than in either of the other two conditions.

Teacher praise of students' intellectual comments was fairly equitably distributed in all conditions in Observation I, but significant differences appeared in the control and problem-solving classroom during Observations II and III. In the microteaching classes, girls received slightly more of these interactions (2%, 1%, 2%). These differences averaged less than one interaction difference per observation. Both females and males in the microteaching condition received virtually the same amount of intellectual praise.

Although both males and females began near equity in the control and problem-solving groups, there was a trend toward more intellectual praise interactions with males over time for both these groups. The control condition began with a slight advantage towards females in Observation I (2%), representing less than one interaction per class, virtual equity. By Observations II and III, males received 7% more intellectual praise. The same pattern was present in the problem-solving condition where virtual equity was achieved in Observation I (.8%) but deteriorated in Observation II (10%) and Observation III (13%), with boys receiving an increasing frequency of intellectual praise. Although both the control and problem-solving conditions reflected a trend of fewer intellectual praise interactions with females, the small number of interactions in this category substantially reduced the impact of these findings.

The relative infrequency of intellectual praise also severly diluted the significance of the data concerning minority students. In the microteaching condition, minority boys were at virtual equity in Observations I (.8%) and II (-1%), but received less than their representative share in Observation III (-7%). Minority girls, on the other hand, received less than their share of these interactions in Observation I (-6%) but were at virtual equity at Observations II (-.2%) and III (-.6%). In the control classes, minority boys were below equity in Observation I (-9%) but at virtual equity during Observations II (.8%) and III (2%). Minority girls in the control group received more than their representative share of intellectual praise in Observation I (9%), but slightly less in Observations II (-2%) and III (-4%). The lack of a discernable statistical trend and the relative infrequency of intellectual praise interactions prevent an adequate analysis of these statistics as they pertain to minority students.

Table 7A indicates that there was a statistically significant difference between the problem-solving and microteaching classrooms. Clearly, the poor performance of the problem-solving condition contrasted sharply with the near equitable showing of the microteaching condition during the last two observations.

Table 7B reflects the lack of statistical significance during any of the observations when using the individual class as the unit of analysis. The low frequency of intellectual praise contributed to the lack of any clear patterns of bias using the classroom as the unit of analysis.

Discussion: Although a majority of all classrooms included intellectual praise, the overwhelming majority of microteaching classes included this interaction, and included it at a much higher rate than either of the other conditions. Seventy-three percent of the control classes (69 of 94) contained intellectual praise averaging 6.7 times per class. Seventy percent of the problem-solving classes (48 of 69) had this interaction, averaging 3.6 times per class. But 94% of the microteaching classes (121 of 129) contained intellectual praise, averaging 11 times per class, a rate which was consistent over time. The data indicated that the microteaching condition utilized substantially more intellectual praise than the other conditions. Once again, we have a finding that may indicate that the microteaching training, specifically designed to ensure that all students were receiving a fair share of the teacher's time and talent, may have also assisted teachers to become more acutely aware of their interaction patterns and to increase the range and responsiveness of their interactions.

TABLE 7A: COMPARISON OF TEACHER PRAISE OF STUDENTS' INTELLECTUAL RESPONSE AND WORK IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	19	5	0.8%	NA	NA
Microteaching	41	11	-2.0%	0.8%	-6.0%
Control	26	6	-2.0%	-9.0%**	9.0%**
Test 1: Problem-solving vs. microteaching: Z = 0.6900 Test 2: Problem-solving & microteaching vs. control: Z = 0.5139					
OBSERVATION II					
Problem-Solving	13	3	10.0%	NA	NA
Microteaching	39	11	-1.0%	-1.0%	-0.2%
Control	22	8	7.0%	0.8%**	-2.0%**
Test 1: Problem-solving vs. microteaching: Z = 2.3896 Test 2: Problem-solving & microteaching vs. control: Z = -0.7313					
OBSERVATION III					
Problem-Solving	16	3	13.0%	NA	NA
Microteaching	41	11	-2.0%	-7.0%	-0.6%
Control	21	6	9.0%	2.0%**	-4.0%**
Test 1: Problem-solving vs. microteaching: Z = 3.1852*** Test 2: Problem-solving & microteaching vs. control: Z = -0.8901					

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

TABLE 7B: TEACHER PRAISE OF STUDENTS' INTELLECTUAL RESPONSE AND WORK IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	18	5.6%	83.3%	11.1%
Microteaching	41	2.4%	92.7%	4.9%
Control	25	0.0%	96.0%	4.0%
	CHI-SQUARE = 2.5943		P ≤ 0.6278	
OBSERVATION II				
Problem-Solving	13	7.7%	92.3%	0.0%
Microteaching	39	10.3%	87.2%	2.6%
Control	22	9.1%	86.4%	4.5%
	CHI-SQUARE = 0.7397		P ≤ 0.9463	
OBSERVATION III				
Problem-Solving	16	0.0%	100.0%	0.0%
Microteaching	41	7.3%	90.2%	2.4%
Control	21	0.0%	95.2%	4.8%
	CHI-SQUARE = 3.6411		P ≤ 0.4568	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Unlike the microteaching classes, the problem-solving classes had a low frequency of intellectual praise, and a lower average than the control classes. In addition, while the microteaching condition maintained virtual equity in the distribution of intellectual praise between males and females, both the problem-solving and control groups registered a trend toward awarding males more praise than expected, and females less than expected. It would be interesting to ascertain if the trend would continue to grow during the second half of the academic year, since the final observation data were gathered during January and February. For the period of this study, we can conclude that the microteaching condition, unlike the others, consisted of a greater number of intellectual praise interactions, and distributed them equitably between males and females over all three observations.

The findings indicate that the percentage of total interactions that were intellectual praise was relatively small (11%, 14%, 12%); although the frequency level of this interaction was not high, its educational impact may be subtantial. It is the strongest reward for academic performance that the teacher has to offer in the fast-paced give-and-take of classroom life. The clear differences among the three conditions should be interpreted within this context.

During Observation III there was a statistically significant difference for the coefficient of distribution when comparing the two treatment groups. However, the low frequency of intellectual praise reduces the impact of statistical findings at the classroom level. Clearly, the microteaching treatment was more equitable and reflected a higher level of intellectual praise than either the problem-solving or control conditions.

D.8 Teacher Acceptance of Student Intellectual Response and Work

Definition: Each time a teacher accepted a student intellectual comment as correct or appropriate, this reaction was coded in the accept category. Typical teacher acceptance reactions were comprised of comments such as, "O.K.," "Uh-huh," and "yes," that were expressed in a matter of fact intonation that reflected neither enthusiasm nor disapproval through sarcasm. Such comments implied approval, but they were not so clearly and strongly stated to be categorized as praise. Whenever teachers did not make explicit evaluation of student intellectual responses, but instead continued with comments or questions that implied the response was accurate, these responses were also coded in the accept category.

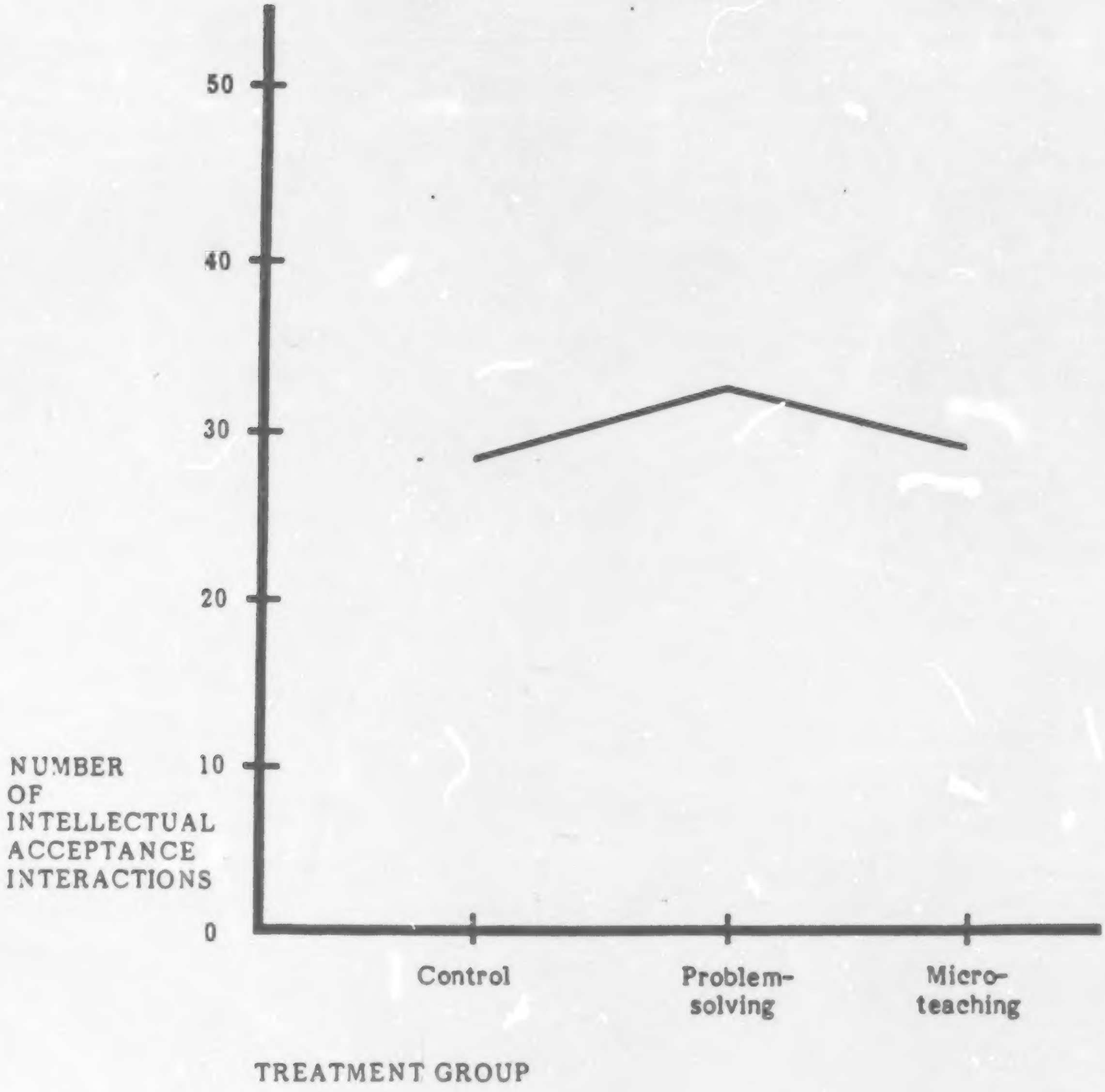
Findings: As Table 8A reflects, all classrooms observed in this study contained teacher acceptance of student intellectual comments. Acceptance of student intellectual comments averaged between 51% and 53% of total classroom interaction. In Observation I 100% of the classrooms (N = 102) contained acceptance of intellectual comments averaging 38 such interactions per class. Observation II data indicate that 100% of classrooms (N = 93) contained an average of 35 intellectual acceptance interactions per class. In Observation III, 100% of the classes (N = 97) contained intellectual acceptance, averaging 33 such interactions per observation. As with the total number of interactions, the number of intellectual acceptance interactions decreased during the course of the year. However, the proportion of intellectual acceptance reactions remained constant over time.

This constancy is displayed in the percentage of intellectual acceptance interactions when compared to all intellectual, all acceptance, and the total of all classroom interactions. When viewed over time, intellectual acceptance accounted for 52% (Observation I), 53% (Observation II), and 51% (Observation III) of total classroom interactions. When compared to intellectual interactions generally, intellectual acceptance accounted for an even higher percentage: 58% (Observation I), 60% (Observation II), and 60% (Observation III). When compared to acceptance in general, the percentage becomes much higher; 83% of all acceptance in Observations I, II, and III was comprised of teacher acceptance of student intellectual comments. In summary, intellectual acceptance occurred in all classrooms; it comprised slightly over half of all classroom interactions, approximately 60% of all intellectual interactions, and 83% of all acceptance interactions.

An analysis of the frequency of intellectual acceptance interactions among the microteaching, problem-solving and control classes revealed the following differences. Over the three time periods, the microteaching classes contained an average of 29 intellectual acceptance interactions; this represented approximately the same frequency of intellectual acceptance interactions that occurred in the control classrooms in the three time periods (30 in Observation I, 26 in Observation II, and 28 in Observation III). In the first observation of the problem-solving intervention, a far higher number of intellectual acceptance interactions (43 per classroom observation in Observation I) was recorded. Observation II reflected a significant drop in the frequency of intellectual acceptance interactions in this condition, although it remained much higher than in the other two conditions (40 per classroom observation). By Observation III, the frequency of intellectual acceptance in the problem-solving condition again declined dramatically so that it was more parallel (32 per classroom observation) with the frequency in the microteaching and control conditions (Figure 8).

The multivariate analysis revealed a treatment effect ($p \leq .048$) which subsequent univariate analysis indicated to be related to the frequency of intellectual acceptance. The problem-solving intervention had the highest frequency of intellectual acceptance (32), while the microteaching intervention had 29 and the control condition had 28 (Table 5, Appendix B).

Figure 8: AVERAGE NUMBER OF INTELLECTUAL ACCEPTANCE INTERACTIONS PER CLASSROOM BY TREATMENT GROUP FOR OBSERVATION III



Teacher acceptance of student intellectual comments was equitably distributed to female and male students in all three conditions in Observation I. In Observation II, equity was maintained in the problem-solving and control conditions, and there was a slight deviation from equity in the microteaching condition where boys received fewer acceptance comments than expected. In Observation III, equity was maintained in the problem-solving condition, but both the microteaching and the control classrooms deviated from equity with male students receiving more teacher acceptance of intellectual comments than expected. However, an analysis of Tables 8A, 8B, and Table 5 in Appendix B does not indicate strong statistical significance among the three conditions.

In the microteaching classes in Observation I, boys received .9% more intellectual acceptance interactions than expected and girls .9% less, an imbalance so slight that it can be considered virtual equity. However, in the Observation II microteaching classes, there was a slight deviation from equity as females received more interactions than expected (3%). It is interesting to note that this is the only time and condition in the category of intellectual acceptance in which there was an imbalance of any magnitude favoring female students. However, this imbalance was reversed in the Observation III microteaching classes where boys received somewhat more intellectual acceptance interactions than expected (4%).

In the problem-solving classrooms, boys received slightly more interactions in Observation I (.4%), in Observation II (1%), and in Observation III (.5%). However, these imbalances were so slight that it is considered that virtual equity in intellectual acceptance interaction was maintained over time for this condition.

In the control classrooms, virtual equity was maintained in Observations I and II. Although girls received slightly more intellectual acceptance interactions in Observation I (.1%) and boys received slightly more intellectual acceptance interactions in Observation II (1%), this imbalance was so slight that it cannot be considered meaningful. However, by Observation III, boys were receiving more intellectual acceptance than girls (6%) in the control condition.

During most of the observations, minority students received somewhat fewer of these interactions than their representation. However, in eight of the twelve observations for which statistics are available, interaction involving minority students varied from their representation in the population by only 3% or less. All of the remaining four cases were in the control condition, with three of these measurements at the 4% level. The microteaching condition was closer to equal representation than the control condition, and too few data are available in the problem-solving classes to evaluate.

Aside from the more equitable distribution of intellectual acceptance in the microteaching classes, two other findings are apparent. Although minority students were close to equity, they generally approached equity from the underrepresented side. Eleven of the twelve measurements concerning minority students are negative values. Second, there was no clear difference between minority males and minority females in this interaction. In two cases, females received fewer of these interactions than males, and in two other cases, males received fewer intellectual acceptance interactions than females. Only in the control condition, Observation II, was any substantial difference reflected (boys +1%, girls -7%). In general, minority students

TABLE 8A: COMPARISON OF TEACHER ACCEPTANCE OF STUDENT INTELLECTUAL RESPONSE AND WORK IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	48	0.4%	NA	NA
Microteaching	43	28	0.9%	-0.8%	-3.0%
Control	35	30	-0.1%	-4.0%**	-2.0%**
Test 1: Problem-solving vs. microteaching:				Z = -0.2284	
Test 2: Problem-solving & microteaching vs. control:				Z = 0.3309	
OBSERVATION II					
Problem-Solving	22	40	1.0%	NA	NA
Microteaching	40	28	-3.0%	-1.0%	-1.0%
Control	29	26	1.0%	1.0%**	-7.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.8000	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.9181	
OBSERVATION III					
Problem-Solving	23	32	0.5%	NA	NA
Microteaching	44	31	4.0%	-3.0%	-0.7%
Control	30	28	6.0%	-4.0%**	-4.0%**
Test 1: Problem-solving vs. microteaching:				Z = -1.3277	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.6527	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

TABLE 8B: TEACHER ACCEPTANCE OF STUDENT INTELLECTUAL RESPONSE AND WORK IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	8.3%	75.0%	16.7%
Microteaching	43	4.7%	86.0%	9.3%
Control	34	2.9%	85.3%	11.8%
	CHI-SQUARE = 1.7974		$P \leq 0.7730$	
OBSERVATION II				
Problem-Solving	22	18.2%	68.2%	13.6%
Microteaching	42	7.1%	90.5%	2.4%
Control	28	3.6%	85.7%	10.7%
	CHI-SQUARE = 7.0297		$P \leq 0.1343$	
OBSERVATION III				
Problem-Solving	23	0.0%	91.3%	8.7%
Microteaching	44	11.4%	77.3%	11.4%
Control	30	0.0%	83.3%	16.7%
	CHI-SQUARE = 7.1219		$P \leq 0.1296$	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

were receiving slightly fewer intellectual acceptance interactions than their representation in the population in the control condition, and they were generally receiving an equitable frequency of intellectual acceptance interactions in the microteaching condition.

No statistically significant differences were found in any of the conditions (Table 8A) or in the classroom measures (Table 8B). Between 68.2% and 91.3% of the classrooms did not have significant levels of bias (Table 8B). However, during Observation III, in the 16.7% of control classes which did reflect bias, this bias was always in the direction of greater male student involvement, a pattern paralleled in previous interactions categories.

Discussion: The findings show that acceptance of student intellectual comments and work is the most frequent teacher reaction in every condition and at every point in time. It is used in all classrooms. It accounts for more interaction than praise, criticism, and remediation combined. It must be remembered that acceptance is the most neutral kind of reaction available for teacher use. Of the four possible teacher reactions categorized in this study, acceptance gives the least precise and useful feedback to the student concerning the quality of intellectual thought and work. While it is clear that acceptance is a useful and legitimate teacher reaction, one must question whether, based on the findings in this study, it is being overused in classrooms and whether increased use of interactive strategies that provide students with more clarity and feedback concerning academic work would increase student achievement.

In this category, the problem-solving intervention contained the greatest number of this type of interaction as well as being the most equitable over time. While the microteaching and control classes began with virtual equity in Observation I, by Observation III acceptance interactions with females had decreased so that male students were receiving 4% of this interaction in the microteaching condition and 6% more of this interaction in the control condition.

As is the case with intellectual praise, there appears to be an increasing likelihood of inequity that favors male students as time increases. However, this imbalance in intellectual acceptance does not become as great as the imbalance that occurs for intellectual praise, nor does it reach statistically significant levels.

D.9 Teacher Remediation of Student Intellectual Response and Work

Definition: Each time a teacher indicated that there was a deficiency in a student's intellectual response or work, or that some corrective action should be taken, these reactions were coded in the intellectual remediation category. Intellectual remediation comments indicated that the teacher did not accept the accuracy of a student's intellectual work or response. Remediation comments were not as strong as actual and overt criticism; they did not involve explicit negative evaluation of academic work or the imposition of penalties. However, when teacher remediation comments were delivered with harsh, sarcastic or angry voice intonation and with negative non-verbal behavior, then these comments were considered as criticism rather than as remediation. Further, when the teacher did not make an explicit evaluation of a student response but instead continued with further comments or questions that implied that the student intellectual response was not accurate, then these reactions were coded in the remediation category.

Findings: Intellectual remediation was the second most frequent interaction. This interaction occurred in all 129 microteaching classes (100%), in 68 of 69 problem-solving classes (99%) and in 92 of 94 control classes (98%). During Observation I, intellectual remediation averaged 19 time per class; in Observation II the average was 16 times per class, and in Observation III the average was 15 times per class. Approximately one of every four classrom interactions was an intellectual remediation.

An analysis of the frequency of intellectual remediation when compared to total intellectual interactions and total remediation interactions underscores its relatively high rate. In terms of all remediation given in the classroom, intellectual remediation comprised the majority (68% in Observation I, 62% in Observation II and 65% in Observation III). Slightly more than one out of every four intellectual interactions was in the remediation category (29% in Observation I, 28% in Observation II, 27% in Observation III).

Although the frequency of intellectual remediation was relatively consistent over time, there were some differences among the three conditions. The microteaching classes averaged a higher frequency of intellectual remediation (16.7) than either the problem solving (14.7) or control (14.3) classes (see Table 9A).

Teacher remediation of the academic efforts of students differed in the three conditions. In the control classes, girls received fewer intellectual remediations than boys, a disparity which existed in all observations and increased with time (7%, 9% and 16%). In the problem-solving classes, boys received more of these interactions in Observation I (4%) and dramatically more than girls in Observation II (15%), but dropped to perfect equity at Observation III (0%). The microteaching condition was stable and at near equity for all three observations, with a distribution coefficient of .2%, -2%, and -2% during the three observations.

Minority girls in the microteaching condition fell below equity in Observation I (14%), but improved their position in Observations II (12%) and III (.5%). Minority boys in microteaching were always near equity (-1%, 1% and -2%). For the control group, minority girls were near equity during observation I (-2%) and fell below equity at Observation II (-6%) and Observation III (-10%). Minority males in the control group began at slightly below equity (-3%), but were near equity at Observation II (2%) and received more than their representative share of intellectual remediation at Observation III (5%).

Table 9A shows statistically significant differences between conditions. In Table 9A, significant differences were reported in Observation II in comparing the effectiveness of the microteaching to the problem-solving groups (Z = 3.4306) and in comparing both treatments to the control groups at Observation III (Z = 4.8077). No levels of statistically significant differences were found using the classroom as the unit of analysis (Table 9B).

Discussion: The data indicate that intellectual remediation was the second most frequent classroom interaction, and accounted for most of the teacher's remediation activities. One out of every four classroom (and intellectual) interactions consisted of the teacher remediation of student's academic performance. The most common teacher activity, intellectual acceptance, is passive in nature. Intellectual remediation, on the other hand, is more

TABLE 9A: COMPARISON OF TEACHER REMEDIATION OF STUDENT INTELLECTUAL RESPONSE AND WORK IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1)	(2)	(3)	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
			(4)	(5)	(6)
Condition	Number of Classrooms	Mean Interactions Per Observation	TOTAL*	Minority Boys	Minority Girls
OBSERVATION I					
Problem-Solving	24	18	4.0%	NA	NA
Microteaching	43	19	- 2.0%	-1.0%	- 4.0%
Control	33	15	7.0%	-3.0%**	- 2.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.3312	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.7363	
OBSERVATION II					
Problem-Solving	22	13	15.0%	NA	NA
Microteaching	42	15	2.0%	1.0%	- 2.0%
Control	29	16	9.0%	2.0%**	6.0%**
Test 1: Problem-solving vs. microteaching:				Z = 3.4306***	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.1696	
OBSERVATION III					
Problem-Solving	22	13	0.0%	NA	NA
Microteaching	44	16	2.0%	-2.0%	0.5%
Control	30	12	16.0%	5.0%**	-10.0%**
Test 1: Problem-solving vs. microteaching:				Z = -0.5482	
Test 2: Problem-solving & microteaching vs. control:				Z = -4.8077***	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

active and provides more clarity for students. Teachers using this response are not simply accepting students comments, but are taking the initiative to correct errors and direct students toward the best possible academic response and work.

Although the control and problem-solving groups averaged 14.3 and 14.7 intellectual remediations per class respectively, the microteachng condition averaged a higher frequency (16.7), and was consistently near equity (±2%). The control group's performance in terms of equity deteriorated over time (7%, 9% and 16%) while the problem-solving group achieved equity by Observation III in an erratic course (4%, 15%, 0%). The two treatment groups were closer to equity for intellectual remediation in all but one of the measures. The microteaching condition consistently out-performed the control, while the problem-solving classes, in spite of an inequitable distribution during the second observation, reached the most equitable performance in the final observation. Once again, the continuously deteriorating pattern of the control classes raises the question of how many fewer intellectual remediations would be given to girls if further observations were made during the second half of the school year.

For minority students, the microteaching condition consistently provided the most representative distribution of intellectual remediation. The data from the control group observations reflected an increasing representation among minority boys (-3%, 2%, 5%) and a decreasing representation of minority girls (12%, -5% and -10%). These data point out the decreasing participation of minority females in intellectual remediation interactions in the control group.

The data reflect that in several of the problem-solving classes (I and II) and in all of the control classes, the teacher was more likely to correct and improve the responses of majority and minority males than to correct and improve the responses of females. Intellectual remediation represents an important step in the learning process, and it is a step more likely to be provided for boys. The question remains as to whether boys' academic performance was more in need of remediation or whether teachers were more likely to invest their time, effort and attention in male students.

The deterioration of the control condition distribution coefficient was underscored on Table 9B by the statistically significant differences between the treatments and the control. While the microteaching favored boys in the number of intellectual remediation interactions by only 2% and the problem-solving was at virtual equity, the control condition was awarding male students 16% more of these interactions than expected.

While the problem-solving condition reached equity in Observation III, it performed poorly in Observation II; a significant difference emerged between the problem-solving and the microteaching group. Overall, the microteaching conditions demonstrated a consistent pattern of near equity (±2%) and had between 83.3% and 95.3% of its classrooms in an equity condition. Conversely, the control group indicated a growing magnitude of inequity over time, both in the overall percentage of interaction awarded to boys (Table 9A) and in the percentage of classrooms with a statistically significant level of bias indicating the greater involvement of boys in classroom participation (Table 9B).

TABLE 9B: TEACHER REMEDIATION OF STUDENT INTELLECTUAL RESPONSE AND WORK IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1) Condition	(2) Number of Classrooms	Percentage of Classrooms Which* (3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	12.5%	75.0%	12.5%
Microteaching	43	4.7%	95.3%	0.0%
Control	32	3.1%	90.6%	6.3%
	CHI-SQUARE = 7.8716		P ≤ 0.0964	
OBSERVATION II				
Problem-Solving	22	0.0%	77.3%	22.7%
Microteaching	42	11.9%	83.3%	4.8%
Control	28	3.6%	78.6%	17.9%
	CHI-SQUARE = 10.1348		P ≤ 0.0899	
OBSERVATION III				
Problem-Solving	23	9.1%	86.4%	4.5%
Microteaching	44	2.3%	86.4%	11.4%
Control	30	0.0%	80.0%	20.0%
	CHI-SQUARE = 6.1535		P ≤ 0.1880	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

D.10 Teacher Criticism of Student Intellectual Responses and Work

Definition: Intellectual criticism refers to those classroom interactions in which a teacher offers explicit disapproval of the quality of a student's idea, response, work or other academic peformance. Criticism is a more negative response than remediation. It clearly indicates negative teacher evaluation, and it may involve the imposition of warning or penalties.

Intellectual criticism has been defined broadly to include both verbal content and voice intonation. Comments such as "That's wrong," "This is an incorrect answer," "This is a weak paper" were all included as intellectual criticism. Furthermore, remediation comments such as "Rewrite this paper," or "Read the paragraph again," were also considered as intellectual criticism if they were delivered with a strong negative intonation or if they were accompanied by clearly negative nonverbal expression and gestures.

Findings: Intellectual criticism was used far less frequently than the other teacher reactions (praise, accept, remediate) to students' academic comments or work. Intellectual criticism occurred in fewer classrooms than the other teacher reactions; further, in those classrooms where it did occur, it was used far less than the other teacher reactions. In Observation I 28% of the classes observed (29 of 102) contained intellectual criticism, averaging three such interactions per class. Observation II data indicate that 26% of classes (24 of 93) contained an average of two intellectual criticism interactions. In Observation III, 18% of the classes (17 of 93) contained intellectual criticism, averaging three such interactions per observation. While intellectual criticism remained constant in Observation I and Observation II in terms of the number of classes in which it occurred, there was a major reduction in the number of classrooms using intellectual criticism in Observation III. The frequency of intellectual criticism remained fairly stable over the three observations (3,2,3) among the decreasing number of teachers who used it.

An analysis of the frequency of intellectual criticism when compared to total interactions and total intellectual interactions underscores its extremely low rate of occurrence. In Observation I, it was four percent of total interactions and five percent of all intellectual interactions. In Observation II, intellectual criticism was three percent of total interactions and three percent of all intellectual interactions. In Observation III, it was five percent of total interaction and five percent of all intellectual interaction. When compared to criticism in general, a different picture emerges as intellectual criticism accounted for 60% of all criticism in Observation I and 100% of all criticism in Observations II and III. Intellectual criticism, therefore, represented a very small percentage of both total interaction and all intellectual interactions, but it comprised almost all of the criticism given in the classroom.

Although the frequency of intellectual criticism was relatively consistent over time, there were some differences among the three conditions. The microteaching classes averaged a higher frequency of intellectual criticism (3.7) than either the problem-solving (1.3) or the control (2.3) per class (see Table 10A). Obviously, the difference in this frequency must be considered within the context of the very low rate of occurence of this type of interaction.

The three conditions also differed in the number of classes which contained intellectual criticism. The microteaching and control classes were relatively similar in terms of the number of classrooms containing intellectual criticism. Thirty-seven percent of the microteaching classes and 31% of the control classes contained intellectual criticism in Observation I. Thirty-one percent of the microteaching classes and 34% of the control classes contained intellectual criticism in Observation II, and 23% of the microteaching classes and 20% of the control classes contained intellectual criticism in Observation III. Far fewer classes in the problem solving condition contained intellectual criticism. For this treatment the figures were eight percent in Observation I, five percent in Observation II, and four percent in Observation III.

In Observation I, male students received slightly more intellectual criticism than female students in the microteaching and control classes and significantly more intellectual criticism in the problem solving classes. Significant differences were found in all conditions by Observations II and III.

In Observation I microteaching classes, boys received somewhat more (4%) intellectual criticism than expected. This more than doubled in Observation II (9%) and almost doubled again (17%) by Observation III. In Observation I control classrooms, as in the microteaching classes, boys received only slightly more intellectual criticism (3%) than expected. This increased dramatically (23%) by Observation II and even further (38%) by Observation III.

In the problem-solving condition in Observation I there was a large disparity in the amount of intellectual criticism given to males and females with males receiving more (46%) than expected. This increased to 56% in Observation II and 59% by Observation III. Although all conditions reported a clear trend of fewer intellectual criticism interactions with females than expected, the very small number of interactions in this category may substantially reduce the impact of these findings.

In terms of minority students, only the microteaching and control conditions offered data for analysis, and given the low frequency of intellectual criticism generally, even these conditions offer only limited findings. In most cases, both minority boys and minority girls received fewer intellectual criticisms than their representation in the classroom population would lead one to expect. Nine of the twelve measures were negative values (below an equitable representation). In Observation II microteaching, minority boys received a slightly higher number of these interactions than their representation (6%). In Observation III in the microteaching condition, minority girls received slightly more of these interactions (3%) and minority boys received slightly more in the control condition (3%). In all other observations, minority students received less intellectual criticism than their representation in the population would lead one to expect. Six of these coefficients of distribution were below -10%, of these three were between -10% and -20%, and three were below -20%. The pattern of wide differences between all the males as compared to all the females was less applicable to minority students. Majority girls and both male and female minority students are far less likely to receive intellectual criticism than are majority boys.

TABLE 10A: COMPARISON OF TEACHER CRITICISM OF STUDENT INTELLECTUAL RESPONSE AND WORK IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
			(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	2	2	46.0%	NA	NA
Microteaching	16	3	4.0%	- 6.0%	-14.0%
Control	11	2	3.0%	- 4.0%**	-22.0%**
OBSERVATION II					
Problem-Solving	1	1	56.0%	NA	NA
Microteaching	13	2	9.0%	6.0%	-15.0%
Control	10	2	23.0%	-24.0%**	-14.0%**
OBSERVATION III					
Problem-Solving	1	1	59.0%	NA	NA
Microteaching	10	4	17.0%	- 7.0%	3.0%
Control	6	3	38.0%	7.0%**	-22.0%**

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

Because of the low rate of occurrence, the significance test are not reliable and have not been presented.

Discussion: The findings show that criticism is the least frequent teacher reaction to student academic performance in every condition and in every observation. Approximately three out of four classrooms did not contain any teacher criticism of student academic response or work whatsoever. In those one out of four classrooms where intellectual criticism did occur, it happened slightly over twice per classroom.

It is clear that criticism is the most negative teacher reaction of the four identified in this study. It also is very likely that criticism will have a strong impact on many students, and it should not be used inappropriately or too frequently. However, based on the findings in this study, one must question whether it is being under used in classrooms. Research indicates that when teachers give students clear feedback concerning their academic work, this is likely to increase student achievement. Therefore, it is possible that an increase in the appropriate use of intellectual criticism (particularly when the criticism is, as defined in this study, comprised of relatively mild comments such as "That's incorrect" or "The answer to number four is wrong") may result in an increase in student achievement.

None of the three conditions maintained equity over time. Although the first observation indicated that there were only minor disparities in the amount of intellectual criticism given to boys and girls in the microteaching and control conditions, by the third observation inequities had increased dramatically in all conditions with boys receiving more intellectual criticism in the microteaching condition in Observations II and III, although inequities were still far less in this condition than in the problem-solving and control classrooms. Since Observation III took place in January and February, one can only question whether these disparities would become even greater as the school year continued.

The inequities in intellectual criticism are interesting to consider in the context of sex differences in grades and achievement scores. While boys receive more negative feedback about their academic work in terms of poor grades and teacher remediation and criticism comments, their scores on standardized tests continue to improve, in relation to their female counterparts, as they progress through school. One must question whether female students are being lulled into a false sense of security by not receiving those remediation and critical comments that are directed toward improving and correcting academic skill and work.

It is also interesting to consider that, while the achievement scores of minority students frequently fall behind those of their majority counterparts, both female and male minority students in this study received less intellectual criticism than their representation in the classroom population would lead one to expect. Again, one must question whether intellectual criticism is a teacher reaction that gives students an important and precise feedback concerning their academic work and whether inequities in the distribution of this reaction may have some effect on disparities in student achievement.

D.11 Conduct Interactions

Definition: Conduct refers to student deportment in class. It is not concerned with the intellectual quality of a student's work, but rather with the way the student's behavior conforms or fails to conform to classroom norms and rules for appropriate conduct. Interactions concerning conduct range from comments about manners, such as "I like the way John is working quietly," to comments about disruption of the class, such as "Stop calling out Mary; wait your turn."

Findings: Interactions concerning conduct were frequent but not universal. Conduct interactions occurred in 85% to 88% of the classes studied. In each of the classes in which conduct interactions occurred, they constituted an average of 5.2 interactions per observation.

The three groups -- microteaching, problem solving, and control -- differ in the number of classrooms that had conduct interactions of any kind. On Table 11A, the "Number of Classrooms" column includes only the classrooms in which conduct interactions occurred, and not the total number of classrooms observed. While the number of classrooms with conduct interactions in the control group remained fairly consistent across observations, the percentage of control classrooms with conduct interactions actually increased in each observation -- from an initial 83% to 90% to 93%. However, the percentage of treatment classrooms with conduct interactions decreased over time, with the most significant decrease occurring in the problem-solving classrooms. The microteaching classes were relatively consistent. During the first observation, 86% of the microteaching classrooms (37 classrooms) had conduct interactions. The percentage of microteaching classes with conduct interactions increased to 88% (37 classrooms) in the second observation, and dropped to 82% (36 classrooms) in the third. In the first observation of the problem-solving classrooms, 100% (24 classrooms) had conduct interactions. This percentage steadily decreased each time -- to 82% (18 classrooms) in the second observation, and 78% (18 classrooms) in the third.

In the control classes, the mean number of conduct interactions decreased from 5 to 4 in Observation II, then stayed at 4 in Observation III. In both sets of intervention classes, the mean number of conduct interaction increased in Observation II. In both sets of intervention classes, the mean number of conduct interactions decreased in Observation III.

In terms of attention given to girls and boys on conduct issues, the control group behaved erratically. In the first observation, the control group was less equitable than either intervention group -- 12% compared with 11% and 6%. The control decreased to a low of 26% in the second observation, but, in the last observation, was near equity (3%).

In the intervention classrooms, there was more stability over time. In fact, the coefficient of distribution in the microteaching classes remained at 11% throughout the three observations. The problem-solving classes started out closest to equity, at 6%, moved closer to equity (4%) in the second and third observations. In all intervention and control groups, boys received more conduct interactions than expected and girls less.

TABLE 11A: COMPARISON OF TEACHER INTERACTIONS CONCERNING STUDENT CONDUCT IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	6	6.0%	NA	NA
Microteaching	37	4	11.0%	1.0%	13.0%
Control	29	5	12.0%	3.0%**	- 2.0%**
Test 1: Problem-solving vs. microteaching:				Z = -1.1575	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.2049	
OBSERVATION II					
Problem-Solving	18	9	4.0%	NA	NA
Microteaching	37	5	11.0%	10.0%	-10.0%
Control	26	4	26.0%	8.0%**	-10.0%**
Test 1: Problem-solving vs. microteaching:				Z = -1.4336	
Test 2: Problem-solving & microteaching vs. control:				Z = -4.4850***	
OBSERVATION III					
Problem-Solving	18	6	4.0%	NA	NA
Microteaching	36	4	11.0%	- 0.1%	- 5.0%
Control	28	4	3.0%	- 1.0%**	- 4.0%**
Test 1: Problem-solving vs. microteaching:				Z = -1.8143	
Test 2: Problem-solving & microteaching vs. control:				Z = .5252	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

Among the minority students, boys generally received more attention on conduct than their representation in the total population. Like majority girls, minority girls received less attention than expected. In the control group, the most inequity occurred during the second observation (26%). In the third observation, the minority boys in the control group were nearly at equity (-1%). The minority girls in the control group consistently received fewer conduct interactions than their representation in the total population. The minority girls received the least number of conduct interactions in the beginning of the year and the most in the second observation.

In the microteaching classes, conduct interactions with minority boys were at virtual equity in the first and third observation, but they received more conduct attention in the second observation than expected. The pattern of conduct interactions with minority girls in the microteaching classes was more consistent, and improved steadily over time (-13%, -10%, -5%). However, minority girls still received less attention concerning conduct than their representation in the total population.

Table 11A reports that a statistically significant difference was found in Observation II when comparing the distribution coefficients of the control condition (26%) with the treatment conditions (4% and 12%) (Z = -4.4850). However, the erratic performance of the control condition, which approached equity (3%) in the final observation, detracts from the import of this finding. The tendency over time for all conditions, but particularly for the control, to have more classrooms reflect a bias for involving more boys in conduct interactions is reflected on Table 11B.

Discussion: Because the mean number of conduct interactions in each observation was small, changes in the frequency had a significant impact on the percentages. Therefore, it is difficult to make generalizations. It may be that conduct interactions are normally low; it may be that teachers control the number of conduct statements that they make in front of an outside observer. Longer observation periods might yield more data that would be more conclusive in this area.

In every group, at every time, boys received more conduct interactions than their representation in the total group, and girls received less. The control group behaved erratically. There seemed to be a pattern of increasing inequity from Observation I to Observation II (12% to 26%) but not in Observation III. In Observation II, when there was the largest coefficient of distribution, (26%), the number of control classrooms with conduct interaction, and the number of conduct interactions per classroom, decreased slightly. This was also the period when statistical significance was achieved.

There was more stability in both intervention classes. In the microteaching classes, the coefficient of distribution remained the same in all three observations. In the problem-solving group, the coefficient of distribution decreased. If teachers are normally random in their distribution of conduct comments between girls and boys, the interventions may have helped teachers become more consistently equitable. However, until a more significant amount of data concerning conduct interaction can be gathered, the distribution of this interaction, as well as the impact of the interventions, can only be hypothesized.

TABLE 11B: TEACHER INTERACTIONS CONCERNING STUDENT CONDUCT IN THE CLASSROOM:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	4.2%	91.7%	4.2%
Microteaching	33	3.0%	87.9%	9.1%
Control	26	3.8%	76.9%	19.2%
	CHI-SQUARE = 3.1743		P ≤ 0.5291	
OBSERVATION II				
Problem-Solving	18	0.0%	77.8%	22.2%
Microteaching	35	0.0%	91.4%	8.6%
Control	23	0.0%	91.3%	8.7%
	CHI-SQUARE = 2.4345		P ≤ 0.2960	
OBSERVATION III				
Problem-Solving	15	0.0%	93.9%	6.7%
Microteaching	32	3.1%	90.6%	6.3%
Control	28	0.0%	92.9%	7.1%
	CHI-SQUARE = 1.3733		P ≤ 0.8488	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

D.12 Teacher Praise of Student Conduct

Definition: Teacher praise for student conduct includes all clearly positive comments about student behavior. It includes statements of positive reinforcement, such as "I like the way Jane and Debby are working together" and "Thank you for being so quiet when I left the room." In addition to strongly positive verbal content, strong emphasis added to a moderately positive statement was coded as praise ("Okay!" said with warmth and enthusiasm).

Findings: Teacher praise for student conduct was virtually non-existent in the classes we studied. There were so few instances of praise in any of the classrooms studied, at any time, that Table 12A shows only the sex of student receiving conduct praise. The control group only had praise for conduct interactions in one classroom in each observation. The microteaching group had one classroom in the first observation with praise for conduct and none thereafter.

Only the problem-solving group had more than one class with any praise for conduct. In the third observation, three problem-solving classrooms had interactions of praise for conduct; moreover, both girls and boys received praise for conduct. Because of lack of data, Table 12b has not been included and no significance tests were run.

Discussion: There were so few instances of praise of student conduct that it is difficult to make any generalizations other than this is an extremely rare form of classroom interaction. The problem-solving classes exhibited the most praise for conduct -- in three classes in the third observation.

In the problem-solving intervention, teachers focused on conduct in their problem solving and were encouraged to use positive reinforcement for good student behavior. Since there was an increase in praise in several of those classrooms during the third observation, perhaps teachers were putting into practice positive reinforcement techniques which were part of the intervention. However, the limited amount of data precludes meaningful analysis.

D.13 Teacher Acceptance of Student Conduct

Definition: Teacher comments about student conduct that are moderately positive but not strong enough to constitute praise were coded as acceptance of conduct. Acceptance may be indicated by "OK," "right," or may be a moderately positive statement such as "I noticed that you handed your story in on time."

Findings: There were very few conduct interactions that could be coded as acceptance, although this interaction was more frequent than teacher praise of student conduct. A few classrooms in each group exhibited a small number of interactions indicating teacher acceptance of student conduct. Only six of the control classrooms included acceptance of conduct interactions, and only one such interaction was in each classroom. The smallest number of classrooms with acceptance of conduct interactions was in the microteaching group and they decreased over time -- from three, to two, to one. The greatest number of acceptance interactions was in the problem-solving classrooms and those increased over time (from eight classrooms to nine to ten).

TABLE 12A: TEACHER PRAISE OF STUDENT CONDUCT IN THE CLASSROOM:

DESCRIPTIVE STATISTICS

Condition (1)	Number of Classrooms	Sex of Student(s) Receiving Contact
OBSERVATION I		
Problem-Solving	1	Boy(s)
Microteaching	1	Girl(s)
Control	1	Boy(s)
OBSERVATION II		
Problem-Solving	1	Boy(s)
Microteaching	0	
Control	1	Boy(s)
OBSERVATION III		
Problem-Solving	3	Boys and Girls
Microteaching	0	
Control	1	Girl(s)

TABLE 13A: TEACHER ACCEPTANCE OF STUDENT CONDUCT IN THE CLASSROOM

DESCRIPTIVE STATISTICS

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	Percentage Going to Girls	Percentage Going to Boys
OBSERVATION I				
Problem-Solving	8	2	61%	39%
Microteaching	3	1	50%	50%
Control	6	1	63%	38%
OBSERVATION II				
Problem-Solving	9	2	42%	58%
Microteaching	2	1	0%	100%
Control	3	1	0%	100%
OBSERVATION III				
Problem-Solving	10	3	57%	43%
Microteaching	1	2	100%	0%
Control	3	1	50%	50%

In addition, the mean number of acceptance interactions per classroom was larger in the problem-solving group (from two interactions in the first two observations to three in the third). Because of the limited data, Tables 13B and 13C are not presented and no significance tests were run.

Discussion: In this category, as in praise of student conduct, the number of interactions was too small for analysis. In most groups, there were only one or two interactions in a few classes in each observation. There were, however, larger numbers in the problem-solving group, both of classrooms and of interactions per classroom. Moreover, there was a clearer pattern in the interactions to girls and boys and the pattern approached equity.

As was pointed out in the praise of conduct section, the problem-solving intervention did include suggestions for teachers to use positive reinforcement to improve student behavior. In the problem-solving sessions, teachers spent much of their time discussing conduct problems and problems of equitably disciplining girls and boys. However, in this category, acceptance of conduct, the problem-solving group started out in the first observation with a higher number of classrooms -- and interactions per classroom -- than the other two groups so it is possible that these teachers were more inclined to comment on their students' deportment. In most categories, the problem-solving classes had more conduct interactions than the other two groups, so it is possible that teachers in this group had more management concerns than other teachers. A longer observation time could yield more data for analysis.

D.14 Teacher Remediation of Student Conduct

Definition: Remediation of conduct includes all comments and indications to students that there is a deficiency in behavior or that some corrective action should be taken. The teacher's remediation comment may imply or explicitly state the nature of the corrective action needed. Examples include comments such as: "Stop that'; "Emily, please sit down until it's your turn." Remediation comments are not so strong as actual criticism; they do not involve explicit negative evaluation or the imposition of penalties. Voice intonation and expression are important here; a harsh tone can move a remediation comment to criticism.

Findings: By far, most conduct interactions were remedial in all classrooms regardless of condition. In both the first and second observations, 86% of the classrooms had conduct remediations; eighty-three percent of classrooms included remediation of student conduct in the third observation. Within the classes where remediation of conduct occurred, conduct was remediated approximately four times per observation.

In the control classrooms, the percentage of classrooms with conduct remediation interactions steadily increased throughout the year -- from 80% (Observation I) to 90% (Observation II) to 93% (Observation III). However, the mean number of remediation interactions per observation remained relatively constant. Approximately four out of five microteaching classes had remediation of conduct interactions (79% in Observation I, 86% in Observation II, 82% in Observation III) with the largest percentage in Observation II. The mean number of interactions per classroom remained constant at four. The problem-solving group showed a steady decrease in the percentage of classes with conduct remediation interactions -- 100% in Observation I, 82% in

Observation II, 74% in Observation III. The mean number of remediation interactions per observation varied, however, from five in the first observation, to seven in the second, and down to four in the third observation.

In the first two observations, both intervention groups had a lower coefficient of distribution than the control; in the control group the coefficient of distribution increased in the second observation (by 10%) while both intervention groups decreased. In the final observation, however, the control classroom came closest to equity (3%) while each intervention group had a 10% coefficient of equity favoring boys.

Minority girls received disproportionately fewer conduct remediation interactions in all classrooms. In the microteaching classrooms, minority girls received fewer conduct remediations than their representation, but moved closer to equity over time (-15% Observation I, -7% Observation II, -4% Observation III). In the control classes, the distribution of conduct remediation for minority girls remained fairly constant (-6%, -6%, -5%), and averaged closer to equity than the microteaching classes in all but the last observation.

Minority boys received more conduct remediation interactions than expected in both the microteaching and control groups. In the third observation, both groups were at virtual equity, in terms of minority boys.

We found statistically significant differences in Observation II between the treatment and control groups (Table 14A). At this point, the microteaching and problem-solving groups had coefficients of distribution of only 6% and 4% respectively, while the control condition reached a distribution coefficient of 24% in favor of boys (Z = -4.7782). However, since there were very few interactions of this type, just a few changes had a large impact on the coefficient. By Observation III, for example, the coefficients of distribution for the interventions had climbed back up to 10%, while the control had dropped to 3%. Although the Observation III differences were not statistically significant, they reverse the pattern of Observation II and inhibit further analysis.

Discussion: The frequency of conduct remediation interactions was small and caution must be used in drawing conclusions from this data. Longer observation times would have increased the data available for analysis.

Boys consistently received more conduct remediation and girls less than their representation in the classroom population. This finding is consistent with other research on classroom interactions. Are boys misbehaving more and being remediated more because of it? Or does male misbehavior draw more teacher remediation than female misbehavior? At least some teachers involved in the interventions reported that they believed that they remediated girls less than boys for the same behaviors -- that is, they allowed girls' misbehavior to go unremediated. This may be an area to explore further in future studies.

In the first two observations, both intervention groups were closer to equity than the control group. Moreover both intervention groups became more equitable between the first and second observation, while the control group grew more inequitable. However, in the third observation, the intervention classes grew more inequitable (10%) and the control classes moved closest to equity (3%), as reflected in Tables 14A and 14B.

TABLE 14A: COMPARISON OF TEACHER REMEDIATION OF STUDENT CONDUCT IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage)		
			(4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	24	5	5.0%	NA	NA
Microteaching	34	4	11.0%	2.0%	-15.0%
Control	28	4	15.0%	3.0%**	- 6.0%**
Test 1: Problem-solving vs. microteaching:				Z = -1.5629	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.7648	
OBSERVATION II					
Problem-Solving	18	7	4.0%	NA	NA
Microteaching	36	4	6.0%	5.0%	- 7.0%
Control	26	3	24.0%	8.0%**	- 6.0%**
Test 1: Problem-solving vs. microteaching:				Z = -0.4376	
Test 2: Problem-solving & microteaching vs. control:				Z = -4.7782***	
OBSERVATION III					
Problem-Solving	23	4	10.0%	NA	NA
Microteaching	44	4	10.0%	-1.0%	- 4.0%
Control	30	4	3.0%	1.0%**	- 5.0%**
Test 1: Problem-solving vs. microteaching:				Z = -0.0467	
Test 2: Problem-solving & microteaching vs. control:				Z = -1.4757	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

TABLE 14B: TEACHER REMEDIATION OF STUDENT CONDUCT IN THE CLASS:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1) Condition	(2) Number of Classrooms	Percentage of Classrooms Which* (3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	24	4.2%	91.7%	4.2%
Microteaching	31	3.2%	93.5%	3.2%
Control	26	3.8%	80.9%	15.4%
	CHI-SQUARE = 3.6295		P ≤ 0.4585	
OBSERVATION II				
Problem-Solving	18	0.0%	83.3%	16.7%
Microteaching	32	0.0%	90.6%	9.4%
Control	23	0.0%	91.3%	8.7%
	CHI-SQUARE = 0.8040		P ≤ 0.6690	
OBSERVATION III				
Problem-Solving	13	0.0%	92.3%	7.7%
Microteaching	32	5.7%	93.8%	3.1%
Control	28	0.0%	96.4%	3.6%
	CHI-SQUARE = 1.8020		P ≤ 0.7721	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

D.15 Teacher Criticism of Student Conduct

Definition: Criticisms of conduct includes any statement or indication that expresses negative evaluation and strong disapproval of student behavior. In addition to clear-cut statements of criticism, remedial statements said in a strongly negative tone of voice or accompanied by angry gestures (e.g., banging the table) are coded as criticism. Examples include "Stop that right now!" (said loudly), or "I'm angry at the way you are behaving." Sometimes criticism is accompanied by the imposition of warnings or penalties (e.g., "If you leave your seat one more time, you will go to the principal's office.").

Findings: Table 15A indicates that there were very few incidents of criticism of conduct in the classrooms observed although not as few as praise of conduct. In Observation I, criticism of conduct occurred in 26% of the classrooms studied, in Observation II in 22%, and in the last observation in 15% of the classrooms observed. In those classrooms there were between one and three interactions of conduct criticism per observation.

The coefficient of distribution of conduct criticism between girls and boys was very large. In every group, at every time, boys received more criticism than their representation and girls received less. The largest coefficient of distribution occured in the problem-solving classes (49%, 24%, 46%). Both intervention groups had their smallest coefficient of distribution in Time II; the coefficient of distribution of the control classrooms increased over time (11%, 21%, 26%).

For minority boys the coefficient of distribution varied greatly in both the microteaching intervention (11%, -2%, 26%) and the control (-3%, 16%, -19%) groups. However, in the microteaching classes, minority boys generally received less conduct criticism than majority boys. In the control classes, in Observations I and III, minority boys received more conduct criticism than majority boys. Minority girls received approximately the same amount of conduct criticism as majority girls.

Discussion: The number of conduct criticism interactions that occurred in these classrooms was very small and, therefore, generalizations are difficult. In all classrooms studied, boys received more conduct criticisms than girls and majority boys received more than minority boys. In the control classrooms, the coefficient of distribution increased steadily with each observation, while in both intervention groups, there was a more equitable coefficient only in the second observation. More observation time would be needed to gather the data required for a more thorough analysis and for determining levels of statistical significance, which are unreliable at this time. Therefore, significance tests are not presented.

D.16 Appearance of Work Interactions

Definition: All comments related to the appearance of student work were recorded in this category. These comments might include praise, accept, remediation or criticism of the neatness, handwriting, conformity to rules or general appearance of academic products. Such products include reports, drawings, test papers, term projects and the like. This category would include such comments as: "Your paper is quite neat," "I can't read your handwriting," "Can you lower your heading about an inch?".

TABLE 15A: COMPARISON OF TEACHER CRITICISM OF STUDENT CONDUCT IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	3	3	49.0%	NA	NA
Microteaching	12	2	23.0%	11.0%	-20.0%
Control	13	3	11.0%	- 3.0%**	3.0%
OBSERVATION II					
Problem-Solving	5	3	24.0%	NA	NA
Microteaching	14	1	11.0%	- 2.0%	-11.0%
Control	3	1	21.0%	16.0%**	-22.0%**
OBSERVATION III					
Problem-Solving	4	2	46.0%	NA	NA
Microteaching	6	1	30.0%	26.0%	-19.0%
Control	5	2	26.0%	-19.0%**	-11.0%**

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

Findings: As Table 16A indicates, very few classrooms contained teacher interactions concerning the appearance of work. Approximately 12% of the problem-solving classrooms and 10% of the microteaching and control classes contained this interaction. This amounted to 11% of all classrooms in Observation I, 9% in Observation II and 12% in Observation III, for an average frequency during these periods of two, two, one. Although some data are presented in Tables 16A, no further data is presented, since the low frequency of this interaction prohibits a meaningful analysis.

Discussion: The appearance of work category was included in the INTERSECT study because of its presence in the literature as an area of sex difference. However, the data reveal that in the typical classroom settings observed in this study, comments related to appearance of work represent a very rare interaction occurring in only a few classrooms. Perhaps this interaction is more frequent in earlier grades, where writing skills and neatness are more salient issues. Or perhaps this interaction does not occur during the formal classroom lesson; rather, it may take place in private conferences and other settings. At any rate, its infrequent occurrence in this study prevents meaningful analysis.

D.17 Personal Appearance Interactions

Definition: Teacher comments related to the personal appearance of students, whether praise, acceptance, remediation or criticism, were coded in this category. Such comments could include: "That's a pretty dress, Judy.", "Today is assembly, Mark, where's you tie?", "Could you straighten out your jacket, Richard?".

Findings: Comments about students' personal appearance, included in the INTERSECT observation system as a result of the literature review indicating that this was an important area of sex difference, were also extremely rare. Only 6% of the classrooms in all conditions had such comments in Observation I, and even this low frequency dwindled to 2% (Observation II) and 1% (Observation III). The frequency within these few classrooms was also low (three, one, one). The infrequency of these interactions is reflected on the abbreviated table display in Table 17A.

D.18 Interactions Other Than Intellectual Content, Conduct and Appearance

Definition: Classroom interactions which do not fit into the previously defined categories (intellectual, conduct, appearance) were recorded in this category. This category included procedural, social and affective comments such as: "I'm glad you brought your friend to class." "Who won the Redskins football game last night?" "Cliques hurt people's feelings. Try to be more considerate."

Findings: The "Other" category appeared frequently in the INTERSECT findings. During Observation I, 96% of all observed classrooms recorded at least one "Other" interaction; 93% in Observation II and 94% in Observation III also recorded this interaction. During these observations, the average frequencies were 13, 10 and 11.

TABLE 16A: APPEARANCE OF WORK INTERACTIONS:

DESCRIPTIVE STATISTICS

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions per Observation
OBSERVATION I		
Problem-Solving	2	1
Microteaching	5	1
Control	4	1
OBSERVATION II		
Problem-Solving	4	2
Microteaching	3	2
Control	1	1
OBSERVATION III		
Problem-Solving	2	2
Microteaching	5	2
Control	5	2

TABLE 17A: PERSONAL APPEARANCE INTERACTIONS:

DESCRIPTIVE STATISTICS

(1) Condition	Number of Classrooms	Sex of Student(s) Receiving Contact
OBSERVATION I		
Problem-Solving	2	Boys and Girls
Microteaching	4	Boys and Girls
Control	0	0
OBSERVATION II		
Problem-Solving	0	0
Microteaching	2	Boys and Girls
Control	0	0
OBSERVATION III		
Problem-Solving	0	0
Microteaching	1	Girls
Control	0	0)

TABLE 18A: COMPARISON OF TEACHER INTERACTION ON TOPICS OTHER THAN STUDENT INTELLECTUAL CONTENT, APPEARANCE AND CONDUCT IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	AVERAGE COEFFICIENT OF DISTRIBUTION (in percentage) (4) TOTAL*	(5) Minority Boys	(6) Minority Girls
OBSERVATION I					
Problem-Solving	20	10	4.0%	NA	NA
Microteaching	43	10	0.3%	-2.0%	- 3.0%
Control	35	14	10.0%	-2.0%**	- 7.0%**
Test 1: Problem-solving vs. microteaching:				Z = .8721	
Test 2: Problem-solving & microteaching vs. control:				Z = -2.7205***	
OBSERVATION II					
Problem-Solving	19	12	3.0%	NA	NA
Microteaching	39	8	- 1.0%	-0.5%	-55.0%
Control	29	12	1.0%	-4.0%**	- 9.0%**
Test 1: Problem-solving vs. microteaching:				Z = 1.0517	
Test 2: Problem-solving & microteaching vs. control:				Z = -0.1190	
OBSERVATION III					
Problem-Solving	19	12	23.0%	NA	NA
Microteaching	43	8	2.0%	2.0%	- 1.0%
Control	30	14	4.0%	-3.0%**	- 5.0%**
Test 1: Problem-solving vs. microteaching:				Z = 6.2346***	
Test 2: Problem-solving & microteaching vs. control:				Z = 2.9367***	

* A positive number indicates that boys are receiving greater frequency than expected; a negative number indicates that girls are receiving greater frequency than expected.

** This statistic applies only to part of the control group where minorities were present. During Observation I it applies to 17 classrooms, during Observation II, 15 classrooms, and during Observation III, 15 classrooms.

*** p ≤ .01, i.e., Z > 2.58 or < -2.58

TABLE 18B: TEACHER INTERACTION ON TOPICS OTHER THAN STUDENT INTELLECTUAL CONTENT, APPEARANCE AND CONDUCT:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

		Percentage of Classrooms Which*		
(1) Condition	(2) Number of Classrooms	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	20	5.0%	90.0%	5.0%
Microteaching	43	0.0%	93.0%	7.0%
Control	34	2.9%	85.3%	11.8%
	CHI-SQUARE = 2.8281		P ≤ 0.5870	
OBSERVATION II				
Problem-Solving	18	5.6%	88.9%	5.6%
Microteaching	39	5.1%	92.3%	2.6%
Control	29	0.0%	89.7%	10.3%
	CHI-SQUARE = 3.2884		P ≤ 0.5108	
OBSERVATION III				
Problem-Solving	19	0.0%	84.2%	15.8%
Microteaching	43	7.0%	81.4%	11.6%
Control	29	3.4%	89.7%	6.9%
	CHI-SQUARE = 2.5426		P ≤ 0.6370	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Table 18A shows that the control classrooms had the most "Other" interactions (13.3), while microteaching had the fewest (8.7). The coefficient of distribution was most equitable in the microteaching condition (.3%, 1%, 2%) and quite erratic in the problem-solving condition, deteriorating rapidly in Observation III (4%, 3%, 23%). The coefficient of distribution in the control classrooms was more equitable in Observations II and III than the problem-solving, but less equitable in Observations I and III than the microteaching intervention (10%, 1%, 4%). Except in the microteaching condition in Observation III for minority boys, minority students in all conditions and at all times received fewer "Other" interactions than their representation in the classroom. The greatest coefficient of distribution inequities were registered in the control condition for minority females (-7%, -9%, -5%).

Table 18A indicates that statistically significant differences were found in Observations I and III. In Observation I, the treatment conditions were significantly more equitable than the control (Z = -2.7205). In Observation III, the control was significantly more equitable than the treatments due entirely to poor performance of the problem-solving group (Z = 2.9367). The strongest statistical difference was between the microteaching and the problem-solving conditions in Observation III (Z = 6.2346).

Table 18B shows that the vast majority of classroom units did not reflect a bias in this category (81.4% to 93%). However, in the approximately 15% of the classrooms that did reflect a bias, the bias was more likely to favor boys than girls, especially in the control condition.

Discussion: "Other" comments represented a rather frequent interaction in well over 90% of the classrooms. While "Other" was defined as non-academic, non-appearance and non-conduct comments, its frequency suggests that further analysis and definition are needed. While we know what "other" comments are not, we need more information to determine precisely what they are. They may represent irrelevant conversation about television programs, weekend excursions and the like, or they may have educationally relevant aspects. Further definition and clarification are needed.

What is clear from the tables is that boys tend to get more of these comments than would be expected, and girls fewer than would be expected in an equitable classroom; further, majority students receive more and minority students fewer than would be expected. Of all the conditions, the microteaching consistently produced the most equitable distribution while the problem-solving at Observation III had a remarkable and statistically significant deterioration in its coefficient. The data reveal that approximately 15% of the classrooms observed had statistically significant differences in this category. The magnitude of these differences, the erratic performance of the problem-solving condition, and the precise nature of the content of the "Other" category are all intriguing areas for further investigation.

D.19 Student Initiated Interactions

Definition: Whenever students initiated comments or questions, these were coded in the student initiation category. In contrast, student comments that were offered in response to teacher initiated comments and questions were not coded in the student initiation category.

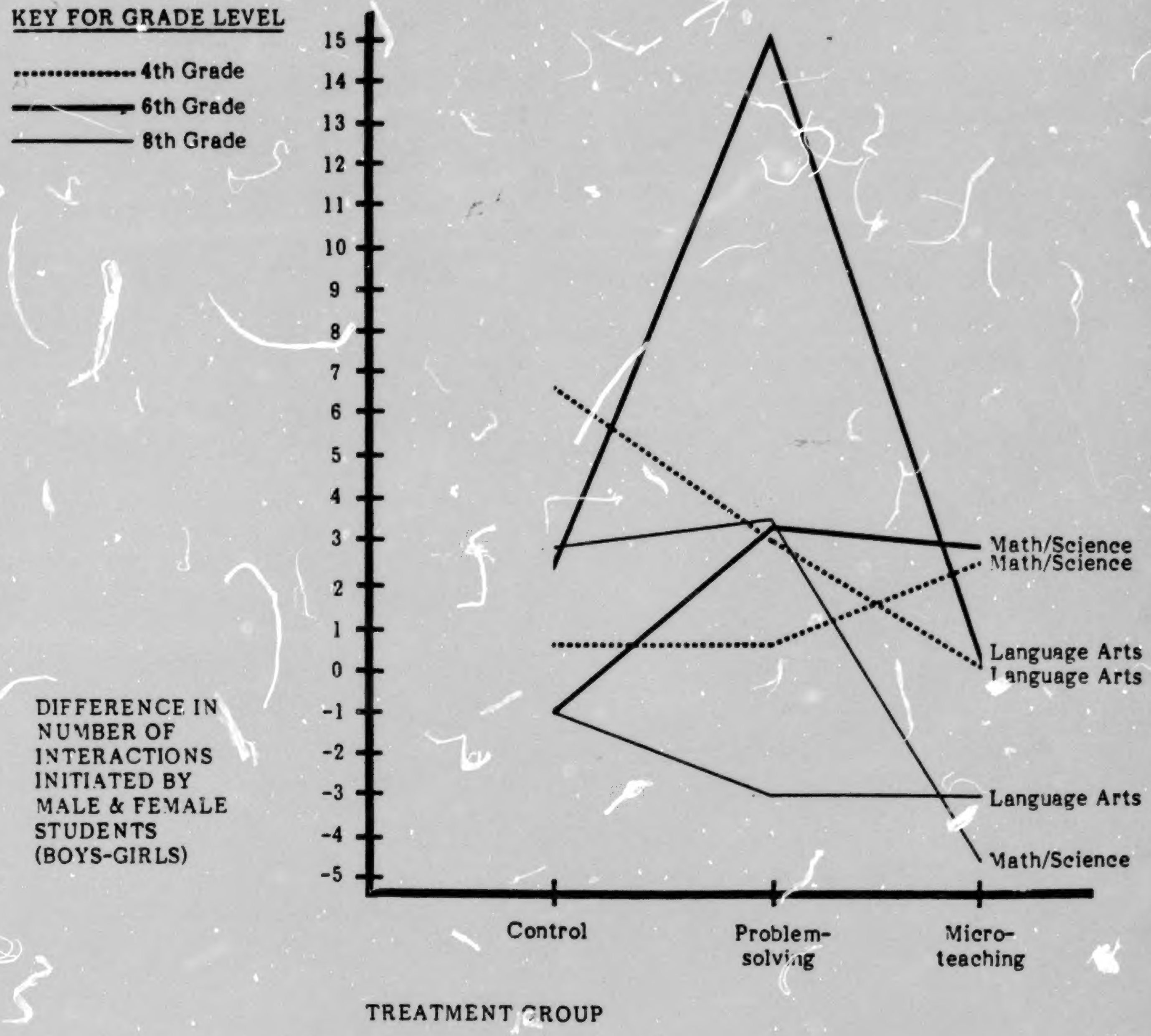
For example, if a teacher asked, "How much are 8 + 4?" and the student responded, "12," this student response would not be coded in the student initiation category. However, if the teacher were giving the class instructions on how to complete a math worksheet and a student raised his or her hand and asked how to add 8 + 4, this question would be coded in the student initiation category.

Students could initiate a comment or question by raising their hand and being recognized by the teacher; by physically moving to the teacher to initiate interaction; or by calling out without waiting for official recognition by the teacher.

Findings: Student initiated interactions occurred in the vast majority of classrooms during the three observation periods (91%, 89%, 91%) at a fairly consistent frequency (14, 14, 12). Boys initiated more interactions than expected at all times and in all conditions. No clear patterns emerged in comparing treatment and control conditions. The greatest bias in the coefficient of distribution appeared in Observation III in the problem-solving condition. The problem-solving condition began with the most equitable distribution coefficient, but deteriorated to the poorest in Observations II and III (2, 9, 16). It was at this third observation that marginal statistical significance was found for differences between the microteaching and problem-solving conditions, and had the Z test been performed between the problem-solving intervention and the control condition, statistical significance may have been found in this area (Table 19A).

While the total frequency of student initiated interactions was not significant ($p \leq .663$), the difference in interactions of this type between males and females was statistically significant ($p = .006$). The multivariate analysis (Table 6, Appendix B) indicated statistical significance for the triple interaction of treatment by grade by subject ($p \leq .008$). This interaction is displayed in Figure 9.

Figure 9: DIFFERENCE IN THE AVERAGE NUMBER OF INTERACTIONS INITIATED BY MALE AND FEMALE STUDENTS (BOYS-GIRLS) PER CLASSROOM BY TREATMENT GROUP, GRADE LEVEL, AND SUBJECT MATTER TAUGHT FOR OBSERVATION III



In the control classrooms, there was a pattern in the language arts classrooms of boys initiating more interactions in the lower grades and girls initiating slightly more of these interactions by the eighth grade with an averge of 6.4, 2.5, and -1.0 respectively. In the math and science control classrooms, there was near equity in the fourth and sixth grades, with boys initiating more interactions by grade eighth (with means of .7, -1.0 and 2.8 respectively). Girls in language arts initiated more frequently than boys only in the eighth grade, but in the math and science control classrooms, by the eighth grade boys were initiating more frequently.

In the problem-solving condition, females exhibited slightly more initiations by grade eight in language arts and proportionally fewer in grade eight in math and science. In math and science, females started closest to equity in grade four and boys increased their proportion of initiations in grades six and eight (with means of .7, 3.3 and 3.5 respectively). In language arts, the problem-solving was the most erratic of the three conditions, containing a huge difference in the distribution of student-initiated interactions in the sixth grade, and a slight disproportion (this time in favor of girls) by the eighth grade (means of 3.0, 15.0 and -.3 respectively).

The language arts microteaching classrooms were at virtual equity in all grades (.2, .3, -.3). However, in the math and science clases, there was a marked departure from what one might expect. While boys initiated more interactions in grades four and six (means of 2.5 and 2.8), unlike the control and problem-solving conditions, girls initiated more interactions in grade eight (-4.6). This differed from the control or expected conditions where boys initiated more interactions (2.8) or the other treatment, problem-solving (3.5) where boys also initiated more interactions.

In all conditions and at all observations, approximately 15% of the classrooms demonstrated a statistically significant bias in this category (Table 19B). The distribution of these coefficients were fairly evenly divided between classrooms demonstrating a bias toward female students and those demonstrating a bias toward male students during Observations I and II, but the overwhelming number of classrooms with biased interactions favored male students by Observation III.

Discussion: Student initiated interactions occurred in a majority of classrooms, and these interactions were initiated more frequently by males in all conditions and at all times. The poor performance of the problem-solving condition in Observation III may provide a clue to the "Other" category discussed in the previous section. The high distribution coefficient reflecting more participation by males than expected in both these categories in the same observation period and in the same condition may be related. Student initiated comments may provide a source of "Other," non-academic, non content comments.

The comparison of Tables 19A and 19B indicate that, although boys initiate the majority of these comments, during Observations I and II when the classroom unit is measured, statistical significance is fairly evenly distributed between girls and boys. This leads one to suspect that although statistical significance is not reached in other classroom units, the coefficient of distribution data indicate that boys initiate more comments than expected in these classrooms. By Observation III, the classroom units with statistically

TABLE 19A: COMPARISON OF STUDENT INITIATED INTERACTIONS IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	(4) Average Coefficient of Distribution in Percentage
OBSERVATION I			
Problem-Solving	21	8	2.0%
Microteaching	39	12	5.0%
Control	31	14	3.0%
Test 1: Problem-solving vs. microteaching:			Z = -0.9500
Test 2: Problem-solving & microteaching vs. control:			Z = .0033
OBSERVATION II			
Problem-Solving	15	12	9.0%
Microteaching	37	10	2.0%
Control	28	17	6.0%
Test 1: Problem-solving vs. microteaching:			Z = -1.7686
Test 2: Problem-solving & microteaching vs. control:			Z = 0.2494
OBSERVATION III			
Problem-Solving	20	12	16.0%
Microteaching	39	11	7.0%
Control	29	14	5.0%
Test 1: Problem-solving vs. microteaching:			Z = -2.3680
Test 2: Problem-solving & microteaching vs. control:			Z = 2.0638

TABLE 19B: INTERACTIONS WHICH STUDENTS INITIATE WITH TEACHERS:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1) Condition	(2) Number of Classrooms	Percentage of Classrooms Which* (3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
OBSERVATION I				
Problem-Solving	21	4.8%	90.5%	4.8%
Microteaching	39	5.1%	84/6%	10.3%
Control	31	12.9%	77.4%	9.7%
	CHI-SQUARE = 2.4382		P 0.6557	
OBSERVATION II				
Problem-Solving	15	13.3%	80.0%	6.7%
Microteaching	37	5.4%	91.9%	2.7%
Control	28	7.1%	82.1%	10.7%
	CHI-SQUARE = 2.8030		P 0.5913	
OBSERVATION III				
Problem-Solving	20	0.0%	85.0%	15.0%
Microteaching	39	5.1%	84.6%	10.3%
Control	29	0.0%	89.7%	10.3%
	CHI-SQUARE = 2.8696		P 0.5801	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

significant bias favored boys far more frequently than girls (11.9% to 1.7%). The data for Observations I and II represent a departure from previous patterns, with females receiving more attention in the various conditions, especially control, than previously reported for other categories.

D.20 Student Call Outs

Definition: Students used a variety of modes to gain the opportunity to make a comment or ask a questions. Whenever a student made a comment or response or asked questions without receiving official teacher recognition, this was coded as a student "call out." Students could use the call out mode either to respond to teacher questions or to initiate comments and questions of their own.

Findings: The vast majority of classrooms contained student call outs (90%, 97%, 94%) which averaged 13, 13 and 8 during the three observation periods. The coefficient of distribution indicates that at all times and in all conditions, boys called out more frequently than expected. The most equitable distribution was in the microteaching condition (average coefficient 7.3%) while the poorest equity coefficient was in the problem-solving condition (14.3%).

The control condition averaged a coefficient of distribution of 11.6%. Statistical significance was found only at Observation II in comparing the two treatments ($Z = 2.8931$). The data indicate that differences between the microteaching treatment alone and the control condition may have been statistically significant in Observations II and III (Table 20A).

In Observation III, a significant three way interaction among treatment, subject matter and grade, was found ($p \leq .048$) in the multivariate analysis (see Table 7, Appendix B). This interaction is displayed in Figure 10. In considering the univariate difference in the total frequency of call outs ($p = .070$), the control classrooms provide us with a view of the expected frequency of this interaction. In the language arts control classrooms, there was a high average frequency of call outs in grades four and eight, higher than any of the other combinations. This high level dropped considerably in grade six (means of 15, 4.83, and 16.5 respectively). In the control math and science classes, there is a low average call out, a lower average in the fourth and sixth grade than any of the other conditions, but this average increased in the eighth grade (means of 5.0, 4.6 and 10.0 respectively) (Figure 10).

The language arts problem-solving classes differ from the expected, beginning with a low call out rate in the fourth grade, peaking in the sixth and dropping off somewhat in the eighth (means of 6.0, 16.0 and 11.67). This is a higher level of call outs than expected (control) classes in grade six, but a lower level in grades four and eight. In the math and science problem-solving classes, the average number of call outs was highest in grade four, dropped in grade six and rose slightly in grade eight (means of 11.5, 5.6, and 7.33). This was greater than expected in fourth and sixth grade, but lower in eighth.

The language arts microteaching classes reflected a pattern similar to the problem-solving intervention, but a generally lower frequencey of call outs. In the microteaching classes, there are fewer than expected call-outs in grades four and eight and higher than expected in grade six (means of 5.71, 9.4, and 7.0 respectively). In the math and science microteaching classes, there was a higher than expected level of call outs in grades four and six, and a slightly higher level in grade eight (means of 8.57, 5.63, and 10.78) (Figure 10).

The distribution of call outs also differed among the three conditions. In language arts, the expected distribution (control condition) started with boys calling out more than girls in the fourth grade and decreased to near equity by the eighth grade (means of 6.60, 2.17, and -.50). The problem-solving slightly favored the boys in grade four, boys calling out far more than girls in grade six, and near equity in the eighth grade (2.0, 12.0, -.33). The language arts microteaching classes were near equity at grades four and eight, but boys called out more in grade six (.29, 4.2, -.67). All three conditions were near equity in the eighth grade and generally boys called out more than girls in the fourth and sixth grades.

In math and science classrooms, the expected condition (control) favored boys in grades four and eight, but the calls out were near equity in grade six (2.0, .20, 4.5). The math and science problem-solving classes had more boys calling out in all three grades (2.5, 3.6, 2.0). In the microteaching condition, boys were calling out more than girls in grades four and six, but for the only time in any condition and grade, girls called out more in the eighth grade (2.29, 1.38, -2.56). There was less variation of distribution in the math and science classes than in the language arts classes, and boys fairly consistently called out more than girls in these classes with only two exceptions (sixth grade control and eighth grade microteaching). This interaction effect is graphically portrayed in Figure 10.

Table 20B indicates that 25% of the problem-solving classrooms, 17% of the microteaching classrooms, and 25% of the control classrooms have statistically significant levels of bias. This bias favored the boys far more frequently than the girls (23% compared to 1.5% in the problem-solving, 10.7% compared to 6.7% in the microteaching, and 20.4% compared to 4.9% in the control). The microteaching condition reflected the most even distribution of classroom units, and the problem-solving had the greatest imbalance.

TABLE 20A: COMPARISON OF STUDENT CALL OUTS IN MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP:

LEVELS OF SIGNIFICANCE BY CONDITION

(1) Condition	(2) Number of Classrooms	(3) Mean Interactions Per Observation	(4) AVERAGE COEFFICIENT OF DISTRIBUTION	
OBSERVATION I				
Problem-Solving	21	11	13.0%	
Microteaching	38	7	9.0%	
Control	30	10	8.0%	
Test 1: Problem-solving vs. microteaching				Z = .9010
Test 2: Problem-solving & microteaching vs. control				Z = .9464
OBSERVATION II				
Problem-Solving	22	10	15.0%	
Microteaching	40	7	5.0%	
Control	26	16	12.0%	
Test 1: Problem-solving vs. microteaching				Z = 2.8931*
Test 2: Problem-solving & microteaching vs. control				Z = 0.5391
OBSERVATION III				
Problem-Solving	21	8	15.0%	
Microteaching	42	8	8.0%	
Control	28	9	15.0%	
Test 1: Problem-solving vs. microteaching				Z = 1.7111
Test 2: Problem-solving & microteaching vs. control				Z = 1.0262

* $p \leq .01$, i.e., $Z > 2.58$ or < -2.58

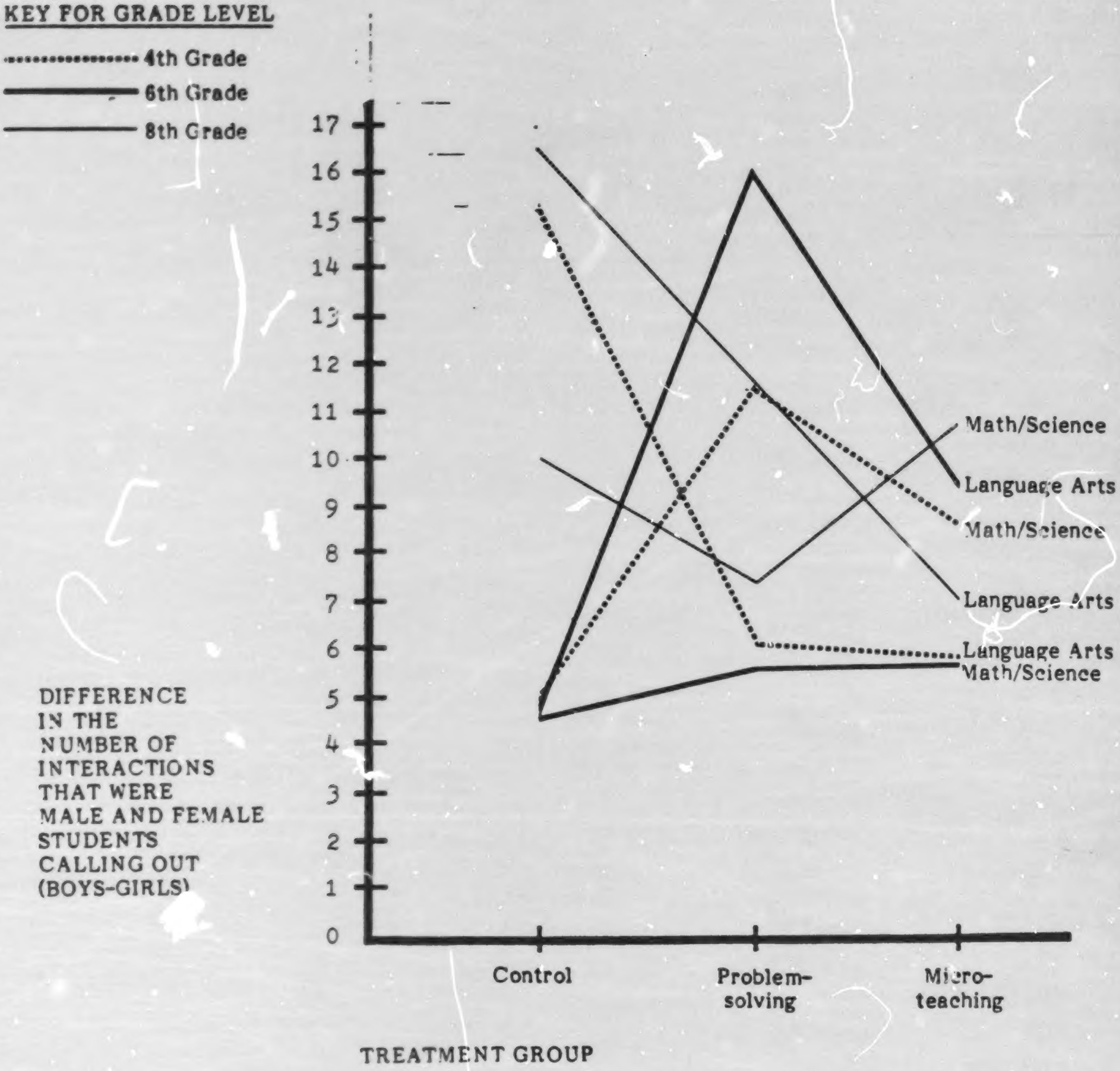
TABLE 20B: INTERACTIONS BETWEEN TEACHERS AND STUDENTS IN WHICH STUDENTS PARTICIPATE BY CALLING OUT:

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(1)	(2)	Percentage of Classrooms Which*		
		(3)	(4)	(5)
Condition	Number of Classrooms	Favor Girls	Reflect No Bias	Favor Boys
OBSERVATION I				
Problem-Solving	21	0.0%	76.2%	23.8%
Microteaching	38	7.9%	81.6%	10.5%
Control	30	3.3%	80.0%	16.7%
	CHI-SQUARE = 3.6033		$P \leq 0.4624$	
OBSERVATION II				
Problem-Solving	22	4.5%	68.2%	27.3%
Microteaching	40	5.0%	90.0%	5.0%
Control	26	7.7%	69.2%	23.1%
	CHI-SQUARE = 7.1435		$P \leq 0.1285$	
OBSERVATION III				
Problem-Solving	21	0.0%	81.0%	19.4%
Microteaching	42	7.1%	76.2%	16.7%
Control	28	3.6%	75.0%	21.4%
	CHI-SQUARE = 1.9541		$P \leq 0.7442$	

* Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

Figure 10: DIFFERENCE IN THE AVERAGE NUMBER OF INTERACTIONS THAT WERE MALE AND FEMALE STUDENTS CALLING OUT (BOYS-GIRLS) PER CLASSROOM BY TREATMENT GROUP, GRADE LEVEL, AND SUBJECT MATTER FOR OBSERVATION III



D.21 Regression Analysis of the Coefficient of Distribution of Call Outs by Students

Findings: In addition to the multivariate analysis, regression coefficients were ascertained relating the number of girls and boys present in a class with the frequency of call outs for each sex and its impact on the coefficient of distribution. These analyses were performed for seven types of interactions described below. The general pattern indicated that there was no relationship between the size of the class and the coefficient. Also, there was a general pattern that as boys called out more, the coefficient of distribution became more positive, i.e. more in favor of boys. However, as the call out of girls increased, the coefficient of distribution was not impacted as strongly. For total interactions, the boys' call outs was related to the coefficient of distribution at a statistically significant level ($p \leq .006$) (Appendix C, Table 1). The subgroup analysis of the microteaching condition for boys found a similarly significant relationship ($p \leq .024$) Appendix C, Table 1. None of these patterns for girls reached significance (Appendix C, Table 2).

This general pattern continued in the acceptance interactions as the increase in boy's call outs led to a higher coefficient of distribution ($p \leq .002$) Appendix C, Table 3) but an increase in girl's call outs had a weaker, non-significant impact on the coefficient in their favor (Appendix C, Table 4). This same pattern continued in the microteaching ($p \leq .033$) and control ($p \leq .081$) subgroup analyses. In the problem-solving condition, however, male call outs had a weaker, non-significant effect on the coefficient while female call outs had a great, near significant effect (See Appendix C, Tables 2 and 4). In the intellectual acceptances (Tables 9 and 10, Appendix C) these same trends were reflected. The increase in boys' call outs was related to a significant increase in the number of intellectual acceptances they received ($p \leq .037$), and in the control this approached significance (Appendix C, Table 9). For females, as in total acceptance interactions, the intellectual acceptances in the problem-solving condition only approached marginal significance (Appendix C, Table 10).

For remediation interactions (Appendix C, Tables 5 and 6), as boys call outs increased, they were involved in significantly more remedial interactions ($p \leq .04$). As girls' call out increased, the remedial interactions with girls actually decreased at a significant level in the control group. No such inverse pattern or levels of statistical significance was found in the interventions. These same general patterns continued in the intellectual remediations (Appendix C, Tables 7 and 8), but unlike the total remediations were not reported in any of the analyses on intellectual remediations.

An analysis of the conduct interactions (Appendix C, Tables 13 and 14) indicate a clear break with previous patterns. As girls' call outs increased, they received a marginally significantly higher share of conduct interactions (Appendix C, Table 14). This relationship did reach statistical significance in the microteaching subgroup analysis ($p \leq .027$), (Appendix C, Table 14). This was not the case in the analyses of boys' increased call outs, which were not related to a greater coefficient of distribution (Appendix C, Table B). The vast majority of conduct interactions were remedial.

Discussion: Boys called out more frequently than expected at all times and in all conditions, but the microteaching condition moderated this somewhat and had the lowest coefficient of distribution as well as the lowest frequency of call outs. This condition reflected a greater degree of equity, and perhaps a greater degree of order as well.

Once again the problem-solving condition produced a higher coefficient of distribution than the control condition in Observations I and II. When statistical significance was reached at the classroom level, boys were far more likely to be calling out than girls, especially in the problem-solving and control classrooms. The only reported statistical significance at Observation II underscored the poorer performance of the problem-solving group when compared to the microteaching condition.

The analyses of the tables displayed in Appendix C provides several interesting insights. As boys' call out, teachers respond to these call outs by providing them with a greater share of classroom interactions. Boys are in effect being rewarded for calling out, receiving more total interactions, more acceptance interactions, more remediation interactions and more intellectual interactions. For boys, calling out results in more active teaching attention.

For girls, this is not the case. An increase in the call outs of females does not result in a significantly greater share of intellectual, acceptance, remediation, or total interactions. It does, however, result in a significant increase in conduct interaction, most of which are remedial. For calling out, it appears that boys are rewarded with greater active teaching and so they continue to call out at a much higher rate than girls. For following the rules and calling out a lower rate than boys, girls receive a lower level of teacher attention. When they do call out, they receive a significantly higher share of conduct interactions, suggesting that teachers are attempting to manage or limit this behavior. A double standard seems to be in play in the teacher's treatment of call outs, a standard which appears to provide boys with a higher level of educational interaction in the classroom.

D.22 Sequencing of Teacher Interaction With Students

Definition: Although the focus of this study concerned the nature and distribution of teacher-student interactions, some investigation of sequencing of interactions was also pursued. While an interaction was considered to be each discrete teacher-student exchange, sequencing included the continuous, uninterrupted flow of one or more interactions between the teacher and the same student. A single interaction may comprise a sequence or a continuous flow of two, three, or more interactions with the same student could also comprise a single sequence. A sequence is delineated as an uninterrupted teacher-same student exchange, regardless of the number of interactions involved.

Findings: The vast majority of sequences (Observation III) consisted of a single interaction (Table 21). Single interaction sequences comprised 67% of the microteaching sequences, 55% of the problem-solving sequences, and 71% of the control sequences. The average length of a sequence was shortest in the control condition (1.36 interactions), and longest in the problem-solving classes (1.72 interactions). The number of sequences involving boys and girls was equitable in the microteaching condition (23.36 vs 24.32), but less equitable in the problem-solving (20.35 vs 15.39) and control (25.23 vs 20.27) conditions (Table 22). Teacher initiated sequences were also more equitable in the microteaching condition (10.52 vs 10.59) than in either the problem-solving (9.65 vs 8.30) or control (11.80 vs 9.07) conditions (Table 22).

The vast majority of sequences were initiated with an intellectual interaction, ranging from 79.8% of the sequences in the microteaching condition to 68% of the sequences in the control condition (Table 23).

TABLE 21: SINGLE INTERACTION

SEQUENCES COMPARED TO TOTAL SEQUENCES BY CONDITION

Condition	Single Interaction Sequences	Total Sequences	Percentage of Single Interaction Sequences
Microteaching	35.55	53.18	67%
Problem-Solving	22.30	40.66	55%
Control	34.80	49.17	71%

TABLE 22: CHARACTERISTICS OF SEQUENCES

	Number of Interactions Per Sequence				Total Sequences	Average Numbers of Interactions Per Sequence
	1	2	3	4 or more		
Microteaching						
Teacher Initiated Sequences With Boys	7.41	1.98	.59	.54	10.52	1.51
Student Initiated Sequences With Boys	9.84	2.23	.50	.27	12.84	1.29
Total Sequences With Boys	17.25	4.20	1.09	.82	23.36	1.43
Teacher Initiated Sequences With Girls	7.59	1.95	.64	.41	10.59	1.45
Student Initiated Sequences With Girls	10.71	2.14	.61	.27	13.73	1.28
Total Sequences With Girls	18.30	4.09	1.25	.68	24.32	1.43
Total Sequences	35.55	8.30	2.34	1.49	47.68	1.42
Problem-Solving						
Teacher Initiated Sequences With Boys	6.34	2.35	.70	.26	9.65	1.46
Student Initiated Sequences With Boys	6.43	2.44	.74	1.09	10.70	1.79
Total Sequences With Boys	12.25	4.78	1.43	1.89	20.35	1.70
Teacher Initiated Sequences With Girls	5.43	1.57	.87	.43	8.30	1.55
Student Initiated Sequences With Girls	4.09	1.65	.70	.65	7.09	1.89
Total Sequences With Girls	9.52	3.22	1.57	1.08	15.39	1.77
Total Sequences	22.30	8.00	3.00	2.44	35.74	1.72

TABLE 22: CHARACTERISTICS OF SEQUENCES
(Continued)

	Number of Interactions Per Sequence				Total Sequences	Average Numbers of Interactions Per Sequence
	1	2	3	4 or more		
Control						
Teacher Initiated Sequences With Boys	8.47	1.90	1.00	.43	11.80	1.42
Student Initiated Sequences With Boys	10.27	2.30	.63	.23	13.43	1.43
Total Sequences	18.73	4.20	1.60	.70	25.23	1.41
Teacher Initiated Sequences With Girls	6.90	1.23	.60	.34	9.07	1.28
Student Initiated Sequences With Girls	9.17	1.47	.50	.06	11.20	1.23
Total Sequences With Girls	16.07	2.70	1.10	.40	20.27	1.32
Total Sequences	34.80	6.90	2.70	1.10	45.50	1.36

TABLE 23: TYPE OF INTERACTION AT THE BEGINNING OF SEQUENCES

	Intellectual	Conduct	Appearance	Appearance of Work	Other	Total
Microteaching Sequences with						
Boys	18.82	1.41	0	.11	3.02	23.36
Girls	19.95	1.25	0	.05	3.07	24.32
Group	3.66	1.14	0	0	0.70	5.50
Totals	42.43 (79.8%)	3.8	0	.16	6.79	53.18
Problem-Solving Sequences With						
Boys	13.83	2.44	0	.04	4.04	20.35
Girls	11.87	1.30	0	0	2.22	15.39
Group	2.96	1.22	0	.04	0.70	4.92
Total	28.66 (70%)	4.96	0	.08	6.96	40.66
Control Sequences With						
Boys	18.00	1.80	0	.17	5.27	25.23
Girls	13.40	1.37	0	.07	5.43	20.27
Group	2.27	0.80	0	0	0.60	3.67
Total	33.67 (68%)	3.97	0	.24	11.3	49.17

In analyzing the coefficient of distribution using sequences rather than interactions, the results paralleled previous findings. No significant differences were found among conditions when analyzing distribution of sequences using the classroom as the unit of measure.

TABLE 24: COMPARISON OF TEACHER-STUDENT SEQUENCES FOR MICROTEACHING AND PROBLEM-SOLVING INTERVENTIONS AND CONTROL GROUP
(OBSERVATION III)

COEFFICIENT OF DISTRIBUTION

Condition	Number of Classrooms	Percentage of Classrooms Which: Favor Girls	Reflect No Bias	Favor Boys
Problem-Solving	23	2	18	3
Microteaching	44	5	36	3
Control	49	0	24	6

The difference between sequences with girls and boys (subtracting the average number of sequences with girls from the average number of sequences with boys) by condition was -.4 for microteaching, 4.5 for problem-solving, and 4.9 for control ($p \leq .07$). This marginally significant difference is similar to the findings which emerged when analyzing interactions (Appendix B, Table 1). The analysis of the coefficient of distribution by sequence, using the classroom as the unit of measurement was not significantly different from the parallel analysis by interaction.

Discussion: The use of sequences rather than interactions in analysis provides a new approach to the analysis of the coefficient of distribution. Sequencing eliminates extended, uninterrupted interaction with the same student from being considered as numerous, separate, distinct exchanges. In this way, no single student can distort the distribution of interactions among all the students.

The analysis of the probabilities of sequences allows the researchers to gauge the tendencies and propensities of teachers to engage in certain kinds of classroom exchanges. Analyzing the various tendencies of teachers to interact with male or female students provides additional insights into the distribution of teacher attention in the classroom.

Analysis of interactions provided the opportunity for the explorations of transitional probabilities describing patterns of sequences. These probabilities characterize various joint and conditional probabilities associated with the longitudinal sequential nature of the uninterrupted teacher-same-student exchanges (sequences). We limit ourselves to a log two model (in Markov Chain terminology) attempting to characterize the likelihood that a certain type of sequence is related to the type of sequence that has preceeded it.

The analysis of sequences rather than interactions did not significantly vary with earlier analysis of the distribution of interaction among boys and girls. Both analyses provided similar results. However, as Table 25 indicates, significant results were found in several probability investigations ($p \leq .05$). The analysis provides the answer to the question, if the teacher initiated the change, what is the probability that the exchange is with a male student? In the control group, teachers were more likely (.606) to initiate these exchanges with a male student (p .05). This was not true in the treatment conditions (problem-solving .501; microteaching .495).

Table 25 (item 7) indicates that when a teacher initiates the interaction in the typical (control) and problem-solving classroom, there is a propensity (not significant) to initiate the next interaction with the same sex (.598). The impact of Table 25 can be found in comparing this tendency with the findings underscored in items 10, 11, and 12. In item 10, the difference between the actual and expected probabilities that a teacher initiated sequence with a male student would be followed by another sequence with a male student was significantly higher in the control condition (.161) than in the problem-solving (.067) or microteaching (-.017) conditions. No such significant relationships were found for the probability of follow-up sequences with female students (item 11).

In item 12, these two probabilities were compared and the difference found to be significant. That is, the tendency of a teacher to interact with the same sex is not evenly shown in the typical or control classroom (.230). This tendency is statistically more likely to happen with male than female students. This tendency is clearly not a classroom artifact, because it does not apply to student initiated exchanges or sequences generally. The finding applies to teacher initiated interactions only. This is a statistically powerful finding underscoring the differences between the control and treatment conditions and also the import of teacher decision making in the classroom.

TABLE 25: TRANSITIONAL PROBABILITIES OF PATTERNS OF SEQUENCES OF INTERACTIONS

Variable	Group	Mean
1. P(T/B) Given a male involved in the exchange, what is the probability the exchange was initiated by the teacher	Total	.457
	Microteaching	.442
	Problem-Solving	.449
	Control	.484
2. P(B/T) If the teacher initiated the exchange, what is the probability that exchange is with a male	Total	.531
	Microteaching	.495*
	Problem-Solving	.501*
	Control	.606*
3. P(T/G) Given a female involved in the exchange, what is the probability that the exchange was initiated by the teacher	Total	.467
	Microteaching	.456
	Problem-Solving	.542
	Control	.425
4. P(B/S) If a student initiated the exchange, what is the probability that the student is male	Total	.538
	Microteaching	.514
	Problem-Solving	.599
	Control	.526
5. P(B) Probability that the sequence is with a male	Total	.525
	Microteaching	.492
	Problem-Solving	.550
	Control	.554
6. P(T) Probability that the teacher initiated the sequence	Total	.456
	Microteaching	.442
	Problem-Solving	.491
	Control	.448
7. P(T/same sex follow-up) If teacher initiated the sequence, what is the probability that the teacher will initiate the next sequence with the same sex student	Total	.557
	Microteaching	.509
	Problem-Solving	.598
	Control	.598
8. P(T/recognize same sex) If the student initiated the sequence, what is the probability that the teacher will recognize the next sequence being initiated by the same sex	Total	.492
	Microteaching	.489
	Problem-Solving	.505
	Control	.488
9. P(same sex interact w/teacher in follow-up) Regardless of who initiated the sequence, what is the probability that the next sequence will be with a student of the same sex	Total	.501
	Microteaching	.480
	Problem-Solving	.506
	Control	.528

TABLE 25: TRANSITIONAL PROBABILITIES OF PATTERNS OF SEQUENCES OF INTERACTIONS
(Continued)

Variable	Group	Mean
10. P(BT,BT) The difference between the observed (actual) probability and the expected (based on theory) probability of a teacher initiated male sequence following another male sequence	Total	.508
	Microteaching	-.017*
	Problem-Solving	.067*
	Control	.161*
11. P(GT,GT) The difference between the observed (actual) probability of a teacher initiated female sequence following another female sequence	Total	.218
	Microteaching	.230
	Problem-Solving	.215
	Control	.191
12. P(Bt,BT) - P(GT,GT) The difference between male probability and female probability discussed above	Total	.061
	Microteaching	-.037*
	Problem-Solving	.028*
	Control	.230*

*Statistically significant difference across the three groups ($p \leq .05$)

D.23 Salient and Silent Students

Definition: The salient student was so named because this student dominated classroom exchanges. The salient student was involved in more than a typical or fair share of classroom discussions. The researchers concern in this study was with the potentially inordinate impact salient students might have on the coefficient of distribution.

Describing the salient student concept is straightforward; however, choosing the criteria for identifying the salient student was far more challenging. Although several alternative criteria were explored, the primary criterion for identifying salient students was students who received three times or more of their fair share of interaction. For example, if a class consisted of 20 students, the expected fair share for any individual student would be 1/20 or 4%. Any student involved in 12% or more of the classroom interactions was considered salient. Using this definition, a class might have several salient students, or no salient students.

Silent students were also investigated and were identified as those students who never interacted in classroom exchanges with other students or with the teacher during classroom observations.

Findings: Salient students accounted for approximately 20-25% of the interaction in classrooms which had salient students. When all classrooms were considered (classrooms with and without salient students), salient students comprised approximately 15% of classroom interactions (Table 26).

When the interactions with salient students were eliminated from the analysis (Observation III), there was no significant impact on the coefficient of distribution by condition ($p \leq .13$). The vote counting method (considering classroom units) was only slightly impacted in the microteaching condition, creating more classrooms with bias toward boys (Table 27).

To determine if analyzing the frequency of sequences rather than interactions would alter these findings, salient students were redefined as those students receiving three times or more of their fair share of sequences. Eliminating the salient students (by sequence) also had no appreciable impact on the coefficient of distribution (Compare Table 27 with Table 1A). However, using sequences did have the effect of slightly redistributing the number of biased classrooms (Compare Table 27 with Table 1B).

TABLE 26: INTERACTION ACCOUNTED FOR BY SALIENT STUDENTS (DEFINITION 1)

(OBSERVATION III)

Condition	Classes with Salient Students	All Classes
	$\frac{\text{average salient student interactions}}{\text{average of all interactions}}$	
Microteaching	$\frac{13.27}{68}$ = .195%	$\frac{\frac{13.27 \times 30}{40}}{68}$ = .133%
Problem-Solving	$\frac{15}{60}$ = .250%	$\frac{\frac{15 \times 16}{23}}{60}$ = .174%
Control	$\frac{12.85}{64}$ .201%	$\frac{\frac{12.85 \times 20}{20}}{64}$ = .134%

TABLE 27: TOTAL TEACHER INTERACTIONS AND SEQUENCES WITH STUDENTS IN THE CLASSROOM OMITTING THE INTERACTIONS WITH SALIENT STUDENTS

LEVELS OF SIGNIFICANCE USING THE CLASSROOM AS THE UNIT OF MEASUREMENT

(OBSERVATION III)

			Percentage of Classrooms Which		
(1) Condition	(2) Number of Classrooms	COD	(3) Favor Girls	(4) Reflect No Bias	(5) Favor Boys
Analysis of Interactions					
Problem-Solving	23	.030	(2)8.7%	(17)73.9%	(4)17.4%
Microteaching	44	.004	(4)9.1%	(30)68.4%	(10)24.3%
Control	30	.073	(1)4.1%	(21)70%	(8)26.7%
Analysis of Sequences					
Problem-Solving	23	.040	(2)8.7%	(16)69.6%	(5)21.7%
Microteaching	44	.004	(4)9.1%	(34)77.3%	(6)13.6%
Control	20	.056	(0)0	(24)80%	(6)20%

*Each class is determined to be in one of these three categories by the following criterion: that the coefficient of distribution significantly differs from 0 at the .05 level.

In order to explore the concept of the salient student more thoroughly, and to compare the impact of various definitions of salient students on classroom equity concerns, several additional analyses were performed. In these multiple analyses, salient students were defined using four different criteria and assessing the impact of each definition on which students by sex and frequency would be identified as salient.

In the initial definition, saliency was defined as those student(s) receiving three times or more their fair share of classroom interactions. Table 28 reports on the number and sex of salient students in each condition using this definition. In the microteaching condition, 29 classes had no female salient students. One class had three female salient students and one class had three male salient students. Data for the one and two salient students per class in the microteaching condition as well as the other conditions are report on Table 28.

In the second definition, a salient student was considered to be the student with the highest frequency of interactions regardless of how many interactions that was. In this definition, each class had one and only, salient student. The sex of the salient student and average frequency of highest interactions are reported on Table 28.

The third concept of salient student depended on the number of sequences rather than interactions. In this approach each and every class had one salient student -- the student with the highest number of sequences. These data are also reported on Table 28.

Blending the previous two definitions, the fourth and final definition defined the salient student as that student with the longest average sequences. This approach incorporated interactive intensity by using the longer sequences of interactions with the same student to determine saliency. Again, one student would be identified in each class and the sex and average length of this measure is found on Table 28.

TABLE 28: FREQUENCY BY SEX OF SALIENT STUDENTS USING FOUR DIFFERENT DEFINITIONS OF SALIENCY

(OBSERVATION III)

	Percentage and Number of Classrooms		Average
	Boys	Girls	
Microteaching (M=44)			
Highest frequency of sequences	21 (47.7%)	25 (52.3%)	6.82
Highest frequency of interaction	20 (45.5%)	24 (54.6%)	10.71
Highest average sequence/interaction	12 (27.3%)	32 (72.7%)	2.92
Frequency of Salient Students			
None	25 (56.8%)	29 (65.9%)	
One	15 (34.1%)	11 (25%)	
Two	3 (6.8%)	3 (6.8%)	
Three	1 (2.3%)	1 (2.3%)	
Total:	44 (100%)	44 (100%)	
Problem-Solving (M=23)			
Highest frequency of sequences	15 (65.2%)	8 (34.8%)	6.04
Highest frequency of interaction	15 (65.2%)	8 (34.8%)	10.70
Highest average sequence/interaction	8 (34.8%)	15 (65.2%)	3.51
Frequency of Salient Students			
None	11 (47.8%)	16 (69.6%)	
One	9 (39.1%)	5 (21.7%)	
Two	2 (8.7%)	1 (4.3%)	
Three	1 (4.3%)	1 (4.3%)	
Total:	23 (100%)	23 (100%)	
Control (M=30)			
Highest frequency of sequences	15 (50%)	15 (50%)	6.87
Highest frequency of interaction	16 (53.3%)	14 (46.7%)	10.37
Highest average sequence/interaction	14 (46.7%)	16 (53.3%)	2.76
Frequency of Salient Students			
None	16 (53.3%)	23 (76.7%)	
One	11 (36.7%)	5 (16.7%)	
Two	3 (10%)	2 (6.7%)	
Three	0 (0%)	0 (0%)	
Total:	30 (100%)	30 (100%)	

Table 29 provides a comparison of the same students identified in two of the saliency definitions. The highest congruence was found between the highest frequency of sequences and the highest frequency of interactions (69.1%). That is, these two saliency definitions identified the same salient students 69.1% of the time. The least congruence was between the highest frequency of sequences and the largest average length of sequences, which identified the same salient student only 5.2% of the time. The remaining comparisons are found on Table 29.

The distribution and frequency of silent students was also investigated. As Table 30 indicates, approximately one in four students (25%), both boys and girls, did not interact in the classrooms observed. No significant sex differences among silent students was noted.

TABLE 29: COMPARISON OF THE PERCENTAGE OF STUDENTS IDENTIFIED AS SALIENT IN TWO OF THE DEFINITIONS OF SALIENCY

(OBSERVATION III)

Salient Student Definitions	Percentage of Congruence
Highest frequency of sequences vs highest frequency of interactions	69.1%
Highest frequency of sequences vs largest average length of sequence	5.2%
Highest frequency of interaction vs largest average length of sequence	12.4%
Highest frequency of sequences vs three times or more expected share of classroom interaction	48.5%
Highest frequency of interaction vs three times or more expected share of classroom interaction	58.8%
Largest average length of sequence vs three times or more expected share of classroom interaction	15.5%

TABLE 30: AVERAGE FREQUENCY OF SILENT STUDENTS BY SEX AND CONDITION

(OBSERVATION III)

	(1) Average Number of Students Interacting With Teacher			(2) Average number of Students in Class		
	Boy	Girl	Combined	Boy	Girl	Combined
Microteaching	8.43	9.32	17.75	11.18	11.84	23.03
(ratio of (1) and (2))	(.75)	(.79)	(0.77)			
Silent Students	25%	21%	23%			
Problem-Solving	8.39	7.43	15.83	10.74	10.57	21.30
(ratio of (1) and (2))	(.78)	(.70)	(0.74)			
Silent Students	22%	30%	26%			
Control	9.30	8.87	18.17	11.83	12.03	23.87
(ratio of (1) and (2))	(.79)	(.74)	(0.76)			
Silent Students	21%	26%	24%			

Discussion: The existence of significant members of salient and silent students underscores the imbalance of classroom interaction. In classrooms with salient students, approximately 20% of the classroom interaction was directed at just a few, active students while 20% of the remaining students received no interaction at all. Many classrooms are marked by extremes of interactive-rich and interactive-poor students.

Analyzing classroom interaction after eliminating the salient students from the computations has only a negligible impact on the coefficient of distribution. The imbalance of interactions cannot be attributed to a single or only a few students. The significant differences between the performance of the treatment groups and the control group is maintained when the participation of salient students is eliminated from the analysis.

In considering the use of sequences rather than interactions in defining saliency, significant differences between the treatments and the control are not maintained. This may indicate that boys are involved in longer sequences than girls. The initiation of single interactions may be less powerful than the longevity or uninterrupted sequence of interactions directed at boys. This longer involvement with the flow of male interactions appears to be a product of teacher decision making; that is, an intentional rather than responsive teacher-student behavior. As such, it represents an imbalance in the nature of classroom interaction which could be altered by conscious teacher decision-making.

The concept of salient student was explored through multiple approaches. In using the primary definition (three times the expected share of interactions), most classrooms in most conditions did not have a salient student. When salient students appeared, approximatey a third to a fourth of the classrooms had a single salient student, between five and ten percent had two salient students and fewer than five percent had three salient students. This definition was the most restrictive in identifying salient students, demanding that a student exert strong dominance of the interaction as a threshold to saliency. More male students than female students were identified as salient in the classrooms observed, especially in the problem-solving (12 *vs* 7) and control (14 *vs* 7) conditions.

Using other approaches to defining saliency, computing the highest frequency of interactions and the highest frequency of sequences yielded similar results. In the microteaching and control conditions, approximately the same number of male and female students were identified as salient. In the problem-solving classes, males were identified as salient twice as frequently as females. The similarity of these two approaches is emphasized on Table 29, which displays a 69.1% congruency. Since the majority of sequences were single interactions, this high congruence was not surprising.

The fourth method of defining saliency utilized the highest average length of a sequence. The results from this method reflected little congurence with results from other approaches. The sex distribution of salient students was actually reversed in the problem-solving condition, and less powerful in the other two conditions. Table 29 underscores the low congruence of this approach to identifying saliency with the other approaches used. The student with the longest average sequence was not the student with the highest frequency of interactions or sequences the vast majority of the time.

Exploring the nature of salient or influential students in dominating classroom interaction represents an intriguing new frontier in analyzing classroom interaction. These preliminary analyses reveal several different approaches to identifying saliency, as well as the tendency in several of these methods for males to be dominant in this influential classroom role.

D.24 Effect of Race and Sex of Teacher on the Amount and Distribution of Interaction

A set of multivariate analyses was conducted on data from Observations I and III to examine the effect of sex and race of teacher on patterns of classroom interactions. In Observation I this analysis included 35 black teachers, 66 white teachers, and one Hispanic teacher. Thirty of these teachers were male and 72 were female. In Observation III this analysis included 31 black teachers, 61 white teachers and one Hispanic teacher. Twenty-four of the teachers were male and 69 were female.

Findings: Analysis of Observation I data indicated that sex and race of teacher did have a statistically significant effect on the amount of or distribution among boys and girls of the following types of interactions: students calling out, total interaction, acceptance interactions, remedial interactions, intellectual interactions, acceptance of intellectual interactions, remediation of intellectual interactions, and conduct interactions. Analysis did indicate a statistically significant interaction effect between the sex of the teacher and the treatment group on the number of student initiated interactions in Observation I classrooms ($p \leq .003$). In both the problem-solving and control groups, classrooms with female teachers had more student initiated comments than those with male teachers. While in the microteaching group, classrooms with male teachers had more student initiated interactions. Sex and race of teacher did not have a statistically significant effect as to whether male or female students were initiating these interactions.

Analyses of Observation III data indicated that sex and race of teacher did not have a statistically significant effect on the amount of or distribution among boys and girls of the following types of interactions: students initiated interactions, students calling out, total interaction, acceptance interactions, remedial interactions, intellectual interactions, remediation of intellectual interactions, and conduct interactions. The analyses did indicate a statistically significant effect for race of teacher on intellectual acceptance interactions ($p \leq .001$) and an interaction effect of sex of teacher and treatment group on intellectual acceptance interactions. Classrooms with white teachers had more intellectual acceptance interactions than classrooms with black teachers. In the control classrooms, classrooms with male teachers had more intellectual acceptance interactions than clasrooms with female teachers. In both the problem-solving and microteaching group classrooms with female teachers had more intellectual acceptance interactions than classrooms with male teachers. This disparity was greatest in the microteaching classrooms. Sex and race of teacher did not have a statistically significant effect on the distribution of intellectual acceptance interactions among boys and girls.

Discussion: The most striking finding was the lack of relationship between the sex and race of teacher and classroom interaction patterns. The common perception that female teachers are more likely to interact with female students was not supported by the data. Nor did the data indicate that black, white, male, or female teachers gave preferential attention to any one sex. In those few types of interaction were sex and race of teacher had some effect, the impact was minimal and never reached statistical significance.

E. Tone Setting Incidents

Currently there is interest in ethnographic approaches to research on classrooms and schools. Consequently, even though the major component of the INTERSECT observation instrument was developed to yield data coded in specific categories, it was decided to set aside a small portion of observation time for recording more anecdotal information to determine if this was a useful approach for research concerning sex equity in the classroom.

Observers received some training in ethnographic research and were asked to describe tone-setting incidents during the last 10 minutes of classroom observations. This time period gave observers the opportunity to make more naturalistic, anecdotal records of classroom events and activities that were likely to inhibit or encourage the attainment of sex equity in the classroom. Sometimes these tone-setting incidents were quite subtle. At other times they were obvious. Sometimes they lasted for an extensive period of time, and on other occasions they were very brief. However, they were always characterized by activity or behavior likely to create a classroom climate that encouraged or inhibited the attainment of sex equity in the learning process. Following are several categories in which tone-setting incidents were recorded:

1) Entry, exit, and transition behavior

2) Classroom digressions

3) Assignment of classroom tasks and jobs

4) Sex segregation or integration

5) Sex bias or equity in language

6) Discipline

7) Salient students.

The following sections will describe the nature and frequency of tone-setting incidents in these categories.

1. Entry, Exit and Transition Behavior: Observers were to note any private discussions or other incidents between teacher and student occurring during entry or exit of students from class or during the transition period in which students complete one activity and begin another. Across all observations and all classrooms notations, in this category were rare. Most entry and exit behaviors consisted of lining up and were noted under the segregation category. The few observations that were recorded were idiosyncratic and confined only to microteaching classrooms. Following is a sample tone-setting incident that occurred in a

microteaching classroom: In one microteaching control classroom (6th grade science) a white female student had an epilepsy attack. She was sitting at a table with three other students. She fell out of her chair onto the floor. The teacher assigned one female to go to the office and notify the nurse. One black male (the only male at the table) was told to "take care of her." This was accomplished by standing next to her with his hand on her neck. The teacher then moved the remaining members of the class to the other side of the room where they sat in a semi-cirlce in front of her and calmly continued the lesson. It was clear to the observer that the students were familiar with this student's seizures. The teacher later informed the observer that she had explained to the class what they were to do in the event of a seizure. The class was very calm, the students did not giggle or make fun of the girl, and they appeared sympathetic rather than frightened. Interestingly, the black male chosen to "take care" of the girl having the seizure was a good deal smaller than several of the other female students who could have been assigned to this role.

2. Classroom Digressions: During classroom lessons, teachers or students may tell anecdotes, give extended examples or make jokes either directly or tangentially related to the subject matter under discussion. Sometimes these examples, anecdotes, and jokes reflect either sex equity or sex role stereotyping in their content. The observers were asked to describe any such digressions in as much detail as possible. Across all conditions and within nearly 300 classroom hours of observation only three such digressions were recorded. One example of a digression that subtly conveyed a sex stereotypic message occurred in a control classroom. The teacher announced, "Do not do this assignment with one of mom's pans. She will hate you if you do." Following is an example of a digression that was more blatant in discouraging sex equity. It occurred in a control science class. "Only 30% of the members of the class were males. The seating arrangement was highly segregated, allowing the boys to be concentrated in one area of the room. The teacher expressed disappointment that none of the boys had produced experiments for the science fair, and that she was surprised because they had good ideas. There was no discussion of the girls' activities in relationship to the science fair."

   An example of a equitable digression occurred in an experimental classroom: The teacher addressed the class, saying "Girls and boys, you know that I care about you, don't you?" The class responded affirmatively and the teacher continued, "Then, please believe me when I tell you that it is very important that you learn this math. It is a skill that you will use every day for the rest of your life no matter what kind of job you have or whether or not you work at all."

3. Assignment of Classroom Tasks and Jobs: Throughout our sample, the assignment of tasks and jobs was varied, ranging from operating projectors, passing out papers, being "head of the table," going to the board, carring textbooks, special display and so on. Most notations in this category suggest that the assignment of tasks and jobs was largely equitable.

4. Sex Segregation or Integration: For every classroom, observers made a diagram of classroom seating, noting the sex and race of the student, placement of the student in the class, and position of the teacher. Observers were also instructed to note any occurrence of sex segregation or integration in the formation of lines, teams, and work and play groupings. From these diagrams and from observer comments regarding lines or teams, the degree of classroom segregation was rated on a three-point scale of high, medium or low. In a highly segregated seating arrangement, the classroom diagram indicated boys on one side of the room and girls on the other. In a moderately segregated arrangement, boys and girls would be distributed throughout the room, but in clusters of all boy and girl tables or areas. Observers considered a seating arrangement to have low, or little segregation, when the seating pattern was, for the most part, integrated by sex. The formation of a line, team or other grouping was considered to be another potential segregation event. If, in forming lines, a separate line for boys and a separate line for girls occurred, it was considered highly segregated; if boys and girls formed one line that allowed boys and girls to cluster by sex, it was considered medium segregation; if the lines or groups were, for the most part, integrated by sex, the event was recorded as low in segregation.

   Based on observers' records, the microteaching experimental classrooms were characterized by the greatest number of sex integration. Of 145 incidents in this category, only 13 were noted as highly segregated, 28 were considered medium, and 104 were ranked as low. In problem-solving experimental classrooms, segregation incidents were recorded primarly in the medium and low ranges. Of 67 reported segregation incidents, four were recorded as high in segregation, 31 as medium, and 32 as low. By contrast, control classrooms were far more segregated. Of 95 incidents reported, 41 were considered as highly segregated, 47 as medium and only seven to be low in segregation.

   Examples of highly segregated classroom arrangements, occurring largely in control classrooms, were noted, for the most part, in seating diagrams and the formation of boys' and girls' lines. However, an example of blatant segregation occurred in two control math classes. In those classes, the teacher formed a girls' team and a boys' team to compete in solving mathematics problems.

   There were many examples of equitable sex integration techniques implemented by intervention classroom teachers and noted by observers. They included: having students line up according to the style of shoe or other articles of clothing; or having students count off by number to form groups, lines, or teams; and seating children alphabetically. Observers in experimental classrooms also recorded teacher intervention to overcome student resistance to integration. In one class a boy objected to sharing a book with a girl. The teacher insisted that they share anyway.

5. Sex Bias or Equity in Language: Bias or inequity in language was noted by observers whenever such supposedly generic words or phrases such as "mankind" or "policeman" were used. Language was considered equitable, if the teacher used phrases such as "humanity," "fire fighter" or "police officer." Observers made anecdotal comments concerning 86 language events in experimental classrooms. Of these, 56 were characterized as equitable and 20 were considered inequitable. In control classrooms, 32 such events

were recorded. Twenty-three were characterized as inequitable, and only nine were considered equitable. Observers also noted equity or inequity in displays, illustrations and exhibits used by teachers. If illustrations showed both girls and boys performing tasks in a non-stereotypic manner, the display was considered equitable. In contrast, if females or males were omitted from a classsroom display or stereotyped in jobs or roles, the exhibit was considered inequitable.

Examples of equity in physical displays were common in experimental classrooms. Some teachers went to considerable trouble to create their own balanced and non-biased displays and classroom exercises. For example, one teacher has a four-color poster titled "The Evolution of Mankind." She made a hand-lettered word, "humanity" and pasted it over the word "mankind". In another classroom, a display of old photographs entitled "The Colonial Family" showed both males and females engaged in tasks associated with pioneer life. In a career education display, women and men were shown in non-traditional occupations, e.g., women as pharmacists, men as teachers in elementary schools, etc. In still another class, a historical display entitled "The First People" featured photographs of male and female native Americans cooperatively weaving, making pottery, and participating in other tasks. Another experimental classroom contained an alphabet display which portrayed males and females in different work roles to exemplify each letter:

"B" was a baseball player -- a black female
"J" was a judge -- a white female
"D" was a doctor -- a white female
"Q" was a quizmaster -- a white male
"E" was an engineer -- a black male

Another teacher in an intervention classroom wrote on the board a list of task assignments which included these designations: lunch persons, room cleaner, office person, ice cream persons, etc.

Observers noted several examples of sex bias in control classroom displays. For example, one classroom had a bulletin board display with illustrations showing boys carrying things and doing math problems while girls cleaned or watched the boys work. In another control classroom, the teacher wrote the following grammar sentences on the blackboard, "Jack ran swiftly to the car". "Mary cried when she ripped her dress." A bulletin board display in a control classroom has a particularly interesting twist: the major heading was "Mother of Heroes" (Mother referred to the country.) All the photographs, however, were of men of the colonial period.

6. Discipline: Research indicates that male students frequently receive more frequent and harsher discipline in the classroom. Consequently, observers noted the manner in which discipline was dispensed in the classroom, whether in a loud and public manner or whether in a private and quiet manner. Observers also noted the context in which a discipline event occurred as well as the race and sex of the student being disciplined.

Based on observer anecdotal comments, it appears that equity in discipline was far more likely to occur in microteaching classrooms. In this condition, anecdotal comments on discipline were noted by observers in 69 classrooms. These comments indicate that in only one of these classrooms was discipline given only to boys. This compared with observer comments for 14 Washington control classrooms in which discipline went only to boys in five classrooms, only to girls in one classroom, and to both boys and girls in eight classrooms. Observers made few comments concerning discipline in the Andover control classes or in the problem-solving classrooms.

Observer comments about discipline in the Washington control classrooms focused on extremely harsh disciplinary actions that were given to male students as well as situations in which both female and male students were misbehaving equally but only male students received teacher reprimands. The following is a typical anecdotal comment concerning inequity in the distribution of discipline in a control classroom. While students were lining up, both boys and girls were talking. The teacher said, "Boys, I can hear you."

Observer comments concerning equitable discipline incidents were common in experimental classrooms. These typically described situations in which both girls and boys were misbehaving and both received appropriate disciplinary action from the teacher.

7. Salient students: Salient students are those individuals who emerge in the classroom as most often interacting with the teacher. They may be children who respond most often to classroom questions or they may receive more frequent praise. Also, they may be considered salient because of their role as classroom disrupters or pranksters. Observer comments concerning salient students were very rare.

Summary

Based on this field-testing of an ethnographic approach to sex equity in classroom interactions, it appears that certain areas appear sufficiently promising to warrant further study. These include the areas of sex segregation, sex equity in language and physical displays, and the distribution of discipline to male and female students. However, the project directors recommended that, if a rich and fruitful data base is to be generated, observers be trained more extensively in ethnographic observation techniques than was the case in this project and that a significantly longer period than ten minutes per observation be set aside for ethnographic recording.

III. SUMMARY OF MAJOR FINDINGS

The following series of statements provides a summary of the patterns, probabilities, and statistically significant findings of the various analytical procedures applied to Intersect observation data. The findings are organized into three broad categories: (1) general characteristics of classroom interaction; (2) bias reflected in classroom interaction; and (3) treatment and control differences.

1. General Characteristics of Classroom Interaction

- In all conditions the frequency of classroom interaction decreased as the grade level increased at a marginally significant level.
- Generally, the frequency of classroom interaction decreased slightly as the school year progressed.
- On the average, there were slightly more than two teacher-student interactions per minute in all classrooms observed.
- Praise constituted a fairly low proportion of total classroom interaction. On the average it occurred only seven times per observation in the typical (control) class and constituted approximately 11 percent of all interaction.
- In approximately 25 percent of the typical (control) classes, teachers never praised students.
- Acceptance was the most frequent teacher response in all classrooms observed. It appeared in all classrooms and accounted for more interaction than praise, criticism, and remediation combined.
- On the average, acceptance occurred more than once a minute and it accounted for approximately 60 percent of all interactions in the typical (control) classroom.
- Remediation occurred in 99 percent of the classrooms observed, averaging almost one remedial interaction per minute. It was the second most frequent interaction comprising approximately one-third of all classroom interaction.
- Of the four teacher reactions, criticism occurred in the fewest number of the classrooms. Approximately two-thirds of the classrooms observed contained no criticism.
- Approximately 39 percent of the typical (control) classrooms contained no criticism.
- In the 37 percent of the total classes observed that contained criticism, the average occurence was only slightly more than three interactions per observation or only five percent of the total interaction.

- All classrooms contained intellectual interaction. Approximately three out of every four classroom interactions was intellectual. In terms of specific types of intellectual interactions, the data showed:

INTELLECTUAL	PERCENTAGE OF TYPICAL (CONTROL) CLASSROOMS USING INTELLECTUAL INTERACTION	AVERAGE FREQUENCY PER OBSERVATION IN TYPICAL (CONTROL) CLASS
Accept	100%	28
Remediate	98%	14
Praise	73%	6
Criticize	29%	2

- In all classrooms, the frequency of intellectual interaction, as with interaction generally, decreased as the grade level increased. The difference between the sixth and eighth grades was statistically significant.

- Conduct interactions occurred in 89 percent of the typical (control) classrooms observed and averaged about four interactions per observation. In terms of specific types of conduct interaction, the data showed:

CONDUCT	PERCENTAGE OF TYPICAL (CONTROL) CLASSROOMS USING CONDUCT INTERACTION	AVERAGE FREQUENCY PER OBSERVATION IN TYPICAL (CONTROL) CLASSROOMS
Remediation	89%	4
Criticism	22%	2
Acceptance	13%	1
Praise	3%	NA

- By far the most frequent type of conduct interaction was remedial in nature, occurring in more classrooms (91 percent) and at a higher rate (an average of four per observation) than all other types of conduct interactions combined.

- Teachers used praise less than acceptance, remediation or criticism when dealing with student conduct.

- All of the typical (control) classrooms contained "other" interactions. These interactions occurred at an average rate of 13 times per observation.

- In approximately half of all classrooms, there were students identified as salient because they received more than three times their proportional share of classroom interaction. These few salient students received more than 20% of all classroom interaction. In contrast, approximately 25% of all students in all classes did not participate in classroom interaction.

2. Bias as Reflected in Classroom Interaction

- Boys participated in more interactions than their representation in the class would lead one to expect. In contrast, girls participated in fewer interactions than their representation would indicate. This inequitable distribution of attention became greater as the year progressed.

- Majority (white) students participated in more interactions than their representation in the classroom would lead one to expect. In contrast, minority students participated in fewer interactions than their representation would indicate.

- Although boys participated in more acceptance interactions than girls, there was less bias in the distribution of acceptance than in the distribution of praise, remediation, or criticism.

- The distribution of acceptance interactions became more biased over time. By the final observation, in one out of every four control classrooms, teachers favored boys in the frequency of acceptance interaction.

- In all observations and conditions, boys received more remedial interactions than girls.

- In approximately one out of every four control classrooms, teachers remediated boys more than girls.

- In all conditions and at all times, boys received more criticism than girls.

- In the typical (control) classes, teachers had more intellectual interactions with boys than with girls, and this difference increased as the school year progressed.

- Of the four intellectual interaction types, intellectual remediation and intellectual criticism were the most inequitable in favor of boys.

- Minority students received fewer intellectual interactions than majority students in the typical (control) classes.

- In all classrooms and at all observations, boys received more conduct interactions than girls.

- In the typical (control) classrooms, minority girls received fewer conduct interactions than their proportion of the class. Minority boys, while receiving more conduct interaction than expected by their representation, received less than majority boys. In fact, minority students generally received fewer conduct interactions than majority students.

- In general, girls and minority students received fewer "other" interactions than expected by their representation in the classroom population.

- Approximately 15 percent of the classrooms observed were biased in the distribution of "other" interactions, and this bias more frequently favored boys.

- As boys called out in class, they received more teacher attention and more interactions with the teacher, especially intellectual interactions. In contrast, as girls called out in class, they did not receive more intellectual interaction with the teacher. What they were more likely to experience was a higher frequency of conduct remediation responses from the teacher.

- In general when teachers initiated interaction, there was a tendency to continue to interact with children of the same sex. However, this tendency varied in the three conditions and between the two sexes.

  -- the tendency to interact with the same sex was more pronounced for boys.

  -- this tendency was stronger for the control groups than for either of the treatment groups ($p \leq .05$)

- Eliminating from the analysis the students identified as salient or more active classrooms participants did not significantly alter the patterns of bias in classroom interaction.

- Approximately half of the typical (control) classrooms were characterized by clear sex segregation in seating and grouping patterns.

- The patterns of classroom bias were not altered by the race or sex of the teacher.

3. Treatment and Control Differences

- Microteaching classes had a slightly higher frequency of interactions than the control classes.

- The microteaching classes were the most equitable of the three conditions. They were at virtual equity in distribution of interactions between boys and girls by the third observation.

- Although the statistical significance varied across the three analytical procedures, in intervention classrooms teachers generally interacted more equitably with boys and girls than did teachers in control classrooms.

- By the third observation, in 40% of the typical (control) classes teachers were participating in more interactions with boys than with girls. This inequitable interaction occurred more than twice as much in control classes than in treatment classes.

- Teachers praised boys more than girls in control and problem-solving classes, although not at a statistically significant level.

- Teachers praised students more frequently in the microteaching condition than in the control and problem-solving conditions combined. This difference was statistically significant.

- Although not statistically significant, in the microteaching intervention teachers praised students in a more equitable manner than did teachers in either of the other conditions.

- The microteaching condition had the lowest frequency of acceptance interactions while the problem-solving condition had the greatest frequency and this difference was statistically significant.

- The distribution of remedial interactions was more equitable in the treatment conditions than in the control condition at a statistically significant level.

- Microteaching had more intellectual interactions than the other conditions at a statistically significant level. The greater frequency of intellectual interactions in the intervention classrooms as compared to the control classrooms was statistically significant.

- There was more intellectual acceptance in the microteaching condition than in the other conditions at a statistically significant level.

- Intellectual interaction was more equitable in the treatment condition than in the control condition at a statistically significant level.

- Of the three conditions, microteaching was the most equitable in the distribution of intellectual praise, remediation and criticism. Problem-solving was most equitable in the distribution of intellectual acceptance although not at a statistically significant level.

- Of the three conditions, control classrooms had the highest frequency of "other" interactions and microteaching classes had the lowest.

- Of the three conditions, microteaching had the most equitable distribution of "other" interactions, although not at a statistically significant level.

DISSEMINATION

During this third project year, major emphasis has focused on research activities. However, some dissemination efforts have been undertaken. Popular awareness pieces on this project's research have appeared in the Washington Post, Parade magazine, Parent magazine, Mademoiselle, Education Week, and many local newspapers. The project coordinators have presented research activities and findings on various television shows including The Today Show; Pittsburgh 2-Day; Everywoman, WDVM-TV; and People Are Talking in Philadelphia, Boston, and Baltimore. Radio presentations include "All Things Considered," National Public Radio; "Karen Shana Show," WRC radio, Washington; "The Jean Hamburg Show," WOR radio, New York, CBS radio network; and Pacifica radio network.

Dissemination activities have also been initiated through the traditional professional channels. A paper on the project's research has been accepted for the April 1984 American Educational Research Association Conference (see attached dissemination piece). Articles are also being prepared for a variety of research and professional journals.

Conclusion and Implications for Future Research and Training

Findings of this three-year research and development project appear to lend further documentation to an extensive line of research indicating differences in the way teachers interact with male and female students in the classroom. This study's findings indicate that 4th, 6th, and 8th grade boys participated in more interactions than did their female counterparts. They received more praise, acceptance, remediation and criticism. They received more intellectual interactions, conduct interactions and "other" interactions. It should be noted that many researchers have linked participation in classroom interaction to achievement and positive attitudes toward school. It also should be noted that acceptance was the least biased teacher response category. Of the four teacher reactions analyzed in this study, acceptance is the most diffuse and appears in this study, acceptance is the most diffuse and appears to be the least helpful in providing students with specific feedback, an instructional behavior often mentioned as important in the literature on effective teaching.

This study indicates that boys appear to be more aggressive in initiating interaction or calling out comments and responses to the teacher. However, the study also shows that when boys call out responses, teachers react with an intellectual response. In contrast, when girls call out comments, the typical teacher response is remediation for inappropriate conduct.

This study also generated knowledge concerning interventions for reducing or eliminating sex bias in the ways teachers respond to female and male students. In most areas, intervention classrooms were successful in eliminating bias from teacher-student interaction. Microteaching classes were the most equitable of the three conditions. It is interesting to note that in intervention classes not only was interaction more equitable but it was more intellectual in nature as well.

This study suggests several avenues for further research. The following suggestions are by no means inclusive.

- A key area for further research involves more precise determination of the relationship between levels of interaction and measures of achievement. It is important to determine how male and female students who receive a high quantity of teacher interaction compare with similarly matched male and female students who receive lower levels of interaction. It may also be fruitful to determine how various types of interaction -- praise, acceptance, remediation, and criticism -- affect attitude and achievement of female and male students. Further, it would be of great interest to analyze the quality of interaction in sex segregated classrooms to determine potential differences in the range of teacher reactions as well as potential impact on student attitude and achievement.

- Another key area for further research involves the relationship between equity and excellence in classroom interaction. For example, this research indicates that interventions for attaining equity in classroom interaction appear to be related to the intellectual level of classroom discussion. Not only was intellectual interaction more equitable in the treatment conditions at a statistically significant level; there was also more intellectual interaction in the intervention classrooms at a statistically significant level. While the area is both controversial and complex, this study suggests direction for teasing out the relationship between equity and excellence in instruction.

- A number of specific aspects of this project suggest the need for further research:
  - The tone setting component was one of the least successful aspects of this project. Further research should be done using a more thorough ethnographic approach concerning issues of equity and excellence in classroom interaction.
  - Another less than fruitful component of this research focused on determining sex differences in teacher-student interaction concerning personal appearance as well as appearance of student work. In this regard, our study did not substantiate prior research concerning sex differences in teacher comments on appearance. We suspect that such interactions occur in more private situations than our observations were able to capture. It would be interesting to determine if such interactions exist and, if so, the type of situations in which they are most likely to occur.
  - This research provides some information on how male and female minority students participate in classroom interaction as compared to their majority counterparts. Clearly, it is essential that more work be conducted in this area.
  - This research involved 4th, 6th, and 8th grade students in the Northeast and Mid-Atlantic regions of the nation. It would be important to conduct similar research at other grade levels and other geographic regions. Further, it would be important to conduct follow up research to determine the long-range impact of the equity interventions.
  - This research did not show sex differences in interaction patterns in language arts/English classes as compared to mathematics/science classrooms. In this aspect it differs from prior investigation. Further work in this area is suggested.
  - This research indicated that, in general, girls and minority students received fewer "other" interactions than expected by their representation in the classroom population. It is important to make more precise determination concerning the nature of their "other" interaction and their impact on student attitude and achievement.
  - This research showed that when teachers initiated interaction, there was a tendency to interact with children of the same sex; further this tendency was statistically more pronounced for boys than for girls. It is intriguing to determine why this occurs if intervention and training can attenuate this tendency.

- The identification of interactive-rich and interactive-poor students underscores that gross distortions may characterize currently used classroom observation instruments which do not assess individual student participation. The role, impact, and even a clear definition of the salient student is called for.

- The relationship and impact of sequences in classroom interaction requires further investigation. Why, when, and how sequences are used, as well as their potential impact on interaction patterns and student achievements suggests an intriguing avenue for research.

Teaching should be an active and intentional process rather than one that is passive and reactive in nature. When teachers become aware of differences in the way they interact with male and female students and when they receive appropriate resources and training, they can become more equitable in their response patterns. Departments, schools, and colleges of education pay scant or no attention to helping teachers develop knowledge and skills in this area. The implications for in-service and opre-service preparation are both obvious and extensive.

APPENDIX A:

SUMMARIES OF MULTIVARIATE ANALYSIS

(OBSERVATION I)

Table 1: Multivariate Analysis of the Frequency of All Interactions (Observation I)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		20.81		2.74	.0001
Total	19404.55		41.97	1.75	.0001
Difference	20.95		.08	1.75	.774
Grade (G)		.60		4.148	.664
Subject Matter (S)		2.60		2.74	.081
Treatment (T)		2.98		4.148	.021
Total	2451.17		5.30	2.75	.007
Difference	283.58		1.13	2.75	.329
G x S		1.75		4.148	.141
T x G		1.88		8.148	.067
T x S		3.25		4.148	.014 *
Total	2648.75		5.73	2.75	.005 *
Difference	158.55		.63	2.75	.535
T x G x S		.81		8.148	.596
Within Cell					
Total	462.33			75	
Difference	251.18			75	
Within Cell Regression		14.98		4.148	.0001
Total	27.90		.06	2.75	.941
Difference	9095.71		36.21	2.75	.0001

* indicates a significant relationship discussed in the text of the report

Table 2: Multivariate Analysis of the Frequency of Accecptance Interaction (Observation I)

Dependent Variables:	1. Total number of interactions 2. Total number of interactions of boys - girls (difference)
Covariables:	1. Total number of students 2. Number of boys - number of girls in class 3. Total number of interactions
Independent Variables:	Grade (4, 6, and 8 grade) Subject (primarily language arts and mathematics) Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		1.73		2.73	.185
Grade (G)		.28		4.146	.891
Subject Matter (S)		6.97		2.73	.002 *
Total	1327.6		12.36	1.74	.001 *
Difference	336.59		3.10	1.74	.082
Treatment (T)		5.38		4.146	.0005 *
Total	1243.67		11.58	2.74	.0001 *
Difference	50.01		.46		.663
G x S		.49		4.146	.745
T x G		1.87		8.146	.068
T x S		.28		4.146	.890
T x G x S		.91		8.146	.511
Within Cell					
Total	107.39			74	
Difference	108.56			74	
Within Cell Regression		21.76		6.146	.0001
Total	3718.22		34.62	3.74	.0001
Difference	1365.37		12.58	3.74	.0001

* indicates a significant relationship discussed in the text of the report

Table 3: Multivariate Analysis of the Frequency of Remediation Interactions (Observation I)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables: Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		1.94		2.73	.151
Grade (G)		.52		4.146	.721
Subject Matter (S)		3.75		2.73	.028 *
Total	742.94		7.19	1.74	.009 *
Difference	27.60		.46	1.74	.502
Treatment (T)		1.24		4.146	.298
G x S		.97		4.146	.424
T x G		1.73		8.146	.096
T x S		1.20		4.146	.312
T x G x S		1.46		8.146	.177
Within Cell					
Total	103.27			74	
Difference	60.57			74	
Within Cell Regression		15.22		6.146	.0001
Total	1528.64		14.80	3.74	.0001
Difference	975.60		16.11	3.74	.0001

* indicates a significant relationship discussed in the text of the report

Table 4: Multivariate Analysis of the Frequency of Intellectual Interaction
(Observation I)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		.11		2.73	.895
Grade (G)		.86		4.146	.493
Subject Matter (S)		1.76		2.73	.179
Treatment (T)		2.69		4.146	.033 *
Total	338.62		4.70	2.74	.012 *
Difference	147.11		.87	2.74	.425
G x S		1.15		4.146	.336
T x G		.83		8.146	.577
T x S		.81		4.146	.519
T x G x S		.90		8.146	.520
Within Cell					
Total	72.02			74	
Difference	169.89			74	
Within Cell Regression		51.73		6.146	.0001
Total	7770.37		107.88	3.74	.0001
Difference	3385.79		19.93	3.74	.0001

* indicates a significant relationship discussed in the text of the report

Table 5: Multivariate Analysis of the Frequency of Intellectual Acceptance (Observation I)

Dependent Variables:	1. Total number of interactions 2. Total number of interactions of boys - girls (difference)
Covariables:	1. Total number of students 2. Number of boys - number of girls in class 3. Total number of interactions
Independent Variables:	Grade (4, 6, and 8 grade) Subject (primarily language arts and mathematics) Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		.65		2.73	.526
Grade (G)		.38		4.146	.823
Subject Matter (S)		5.15		2.73	.008 *
Total	920.19		8.54	1.74	.005 *
Difference	238.80		2.92		.091
Treatment (T)		5.70		4.146	.0003 *
Total	1283.38		11.91	2.74	.0001 *
Difference	82.18		1.01	2.74	.370
G x S		.41		4.146	.803
T x G		1.23		8.146	.288
T x S		.42		4.146	.794
T x G x S		.85		8.146	.558
Within Cell					
Total	107.76			74	
Difference	81.66			74	
Within Cell Regression		15.55		6.146	.0001
Total	2388.81		22.17	3.74	.0001
Difference	864.26		10.58	3.74	.0001

* indicates a significant relationship discussed in the text of the report

Table 6: Multivariate Analysis of the Frequency of Student Initiated Interactions
(Observation I)

Dependent Variables:	1. Total number of interactions 2. Total number of interactions of boys - girls (difference)
Covariables:	1. Total number of students 2. Number of boys - number of girls in class 3. Total number of interactions
Independent Variables:	Grade (4, 6, and 8 grade) Subject (primarily language arts and mathematics) Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Signifiance Level
Grand Mean		2.89		2.62	.063
Grade (G)		2.54		4.124	.043
Total	314.30		4.75	2.63	.012
Difference	15.51		.45	2.63	.637
Subject Matter (S)		1.18		2.62	314
Treatment (T)		1.28		4.124	.283
G x S		.56		4.124	.696
T x G		2.08		8.128	.043 *
Total	223.33		3.37	4.63	.015 *
Difference	36.15		1.06	4.63	.384
T x S		1.17		4.124	.328
T x G x S		.71		8.124	.681
Within Cell					
Total	66.19			63	
Difference	34.11			63	
Within Cell Regression		3.91		6.124	.001
Total	79.68		1.20	3.63	.316
Difference	249.83		7.33	3.63	.0003

* indicates a significant relationship discussed in the text of the report

APPENDIX B:

SUMMARIES OF MULTIVARIATE ANALYSIS

(OBSERVATION III)

Table 1: Multivariate Analysis of the Frequency of All Interactions (Observation III)

Dependent Variables:	1. Total number of interactions 2. Total number of interactions of boys - girls (difference)
Covariables:	1. Total number of students 2. Number of boys - number of girls in class 3. Total number of interactions
Independent Variables:	Grade (4, 6, and 8 grade) Subject (primarily language arts and mathematics) Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		23.05		2.76	.0001
Total	15380.10		46.70	1.77	.0001
Difference	151.57		.66	1.77	.419
Grade (G)		3.65		4.152	.007 *
Total	2549.95		7.74	2.77	.001 *
Difference	11.00		.05	2.77	.953
Subject Matter (S)		1.09		2.76	.340
Treatment (T)		2.34		4.152	.057
G x S		.93		4.152	.451
T x G		1.57		8.152	.138
T x S		1.12		4.152	.348
T x G x S		1.21		8.152	.294
Within Cell					
Total	329.34			77	
Difference	229.91			77	
Within Cell Regression		10.36		4.152	.0001
Total	115.31		.35	2.77	.706
Difference	5386.88		23.43	2.77	.0001

* indicates a significant relationship discussed in the text of the report

Table 2: Multivariate Analysis of the Frequency of Acceptance Interaction (Observation III)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables: Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		1.28		2.75	.283
Grade (G)		.57		4.150	.687
Subject Matter (S)		1.02		2.75	.365
Treatment (T)		6.78		4.150	.0001 *
Total	1403.76		11.45	2.76	.0001 *
Difference	192.49		2.12	2.76	.127
G x S		.50		4.150	.739
T x G		1.12		8.150	.355
T x S		.45		4.150	.772
T x G x S		.56		8.150	.806
Within Cell					
Total	122,47			76	
Difference	90.79			76	
Within Cell Regression		20.95		6.150	.0001
Total	3889.94		31.73	3.76	.0001
Difference	1137.43		12.53	3.76	.0001

* indicates a significant relationship discussed in the text of the report

Table 3: Multivariate Analysis of the Frequency of Remediation Interactions (Observation III)

Dependent Variables:	1. Total number of interactions 2. Total number of interactions of boys - girls (difference)
Covariables:	1. Total number of students 2. Number of boys - number of girls in class 3. Total number of interactions
Independent Variables:	Grade (4, 6, and 8 grade) Subject (primarily language arts and mathematics) Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		1.15		2.75	.318
Grade (G)		.40		4.150	.805
Subject Matter (S)		1.73		2.75	.184
Treatment (T)		2.62		4.150	.037 *
Total	308.25		2.59	2.76	.081 *
Difference	131.63		2.41		.097 *
G x S		1.21		4.150	.309
T x G		.87		8.150	.546
T x S		1.07		4.150	.372
T x G x S		1.63		8.150	.122
Within Cell					
Total	118.80			76	
Difference	54.72			76	
Within Cell Regression		4.16		6.150	.001
Total	354.59		2.98	3.76	.036
Difference	352.43		6.44	3.76	.001

* indicates a significant relationship discussed in the text of the report

Table 4: Multivariate Analysis of the Frequency of Intellectual Interaction
(Observation III)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		.15		2.75	.861
Grade (G)		3.91		4.150	.005 *
Total	540.12		7.61	2.76	.001 *
Difference	75.58		.47	2.76	.628
Subject Matter (S)		.24		2.75	.784
Treatment (T)		5.44		4.150	.0005 *
Total	508.46		7.17	2.76	.001 *
Difference	485.42		3.01	2.76	.055
G x S		1.12		4.150	.348
T x G		.82		8.150	.586
T x S		1.86		4.150	.121
T x G x S		.64		8.150	.747
Within Cell					
Total	70.95			76	
Difference	161.31			76	
Within Cell Regression		39.71		6.150	.0001
Total	5717.45		80.59	3.76	.0001
Difference	2382.09		14.77	3.76	.0001

* indicates a significant relationship discussed in the text of the report

Table 5: Multivariate Analysis of the Frequency of Intellectual Acceptance (Observation III)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		1.32		2.75	.272
Grade (G)		1.33		4.150	.261
Subject Matter (S)		1.25		2.75	.293
Treatment (T)		2.46		4.150	.048 *
Total	322.98		3.19	2.76	.047 *
Difference	122.64		1.79	2.76	.173
G x S		.68		4.150	.606
T x G		1.17		8.150	.321
T x S		.54		4.150	.704
T x G x S		.45		8.150	.891
Within Cell					
Total	101.22			76	
Difference	63.36			76	
Within Cell Regression		17.83		6.150	.0001
Total	2570.40		25.39	3.76	.0001
Difference	827.72		12.11	3.76	.0001

* indicates a significant relationship discussed in the text of the report

Table 6: Multivariate Analysis of the Frequency of Student Initiated Interactions
(Observation III)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		2.38		2.66	.101
Grade (G)		2.25		4.132	.068
Subject Matter (S)		.45		2.66	.641
Treatment (T)		1.81		4.132	.130
G x S		.17		4.132	.951
T x G		.88		8.132	.538
T x S		1.00		4.132	.411
T x G x S		2.72		8.132	.008 *
Total	60.07		.60	4.67	.663
Difference	99.40		3.96	4.67	.006 *
Within Cell					
Total	99.92			67	
Difference	25.13			67	
Within Cell Regression		2.99		6.132	.009
Total	33.79		.34	3.67	.798
Difference	119.10		4.74	3.67	.005

* indicates a significant relationship discussed in the text of the report

Table 7: Multivariate Analysis of the Frequency of Student Interactions Through Callouts
(Observation III)

Dependent Variables:
1. Total number of interactions
2. Total number of interactions of boys - girls (difference)

Covariables:
1. Total number of students
2. Number of boys - number of girls in class
3. Total number of interactions

Independent Variables:
Grade (4, 6, and 8 grade)
Subject (primarily language arts and mathematics)
Treatment (microteaching, problem-solving and control)

Source of Variation	Mean Square	Multivariate F	Univariate F	Degree of Freedom	Significance Level
Grand Mean		3.96		2.138	.024
Total	325.44		7.80	1.70	.007
Difference	2.92		.13	1.70	.715
Grade (G)		3.20		4.69	.015
Total	139.75		3.35	2.70	.041
Difference	35.38		1.62	2.70	.204
Subject Matter (S)		.39		2.138	.680
Treatment (T)		1.23		4.69	.301
G x S		.90		4.138	.464
T x G		1.13		8.138	.347
T x S		.91		4.138	.460
T x G x S		2.02		8.138	.048 *
Total	94.98		2.28	4.70	.070
Difference	38.24		1.76	4.70	.148
Within Cell					
Total	41.75			70	
Difference	21.77			70	
Within Cell Regression		2.73		6.138	.015
Total	71.53		1.71	3.70	.172
Difference	69.55		3.19	3.70	.029

* indicates a significant relationship discussed in the text of the report

APPENDIX C:

REGRESSION COEFFICIENTS RELATING THE NUMBER OF BOYS AND GIRLS PRESENT IN THE CLASSROOM AND THE FREQUENCY WITH WHICH BOY AND GIRL STUDENTS CALL OUT TO THE COEFFICIENT OF DISTRIBUTION FOR OBSERVATION III

Table 1: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Total Interaction

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (91)	- .0031	0	n.s.
	- .0040	.0074 (.002)	(.006)
Sub-group			
control (28)	.0008		n.s.
	- .0012	.0055 n.s.	n.s.
problem-solving (21)	- .0029		n.s.
	- .0010	.0070 n.s.	n.s.
microteaching (42)	- .0051		n.s.
	- .0063	.0119 (.016)	(.024)

( ) = p value of significant results.
n.s. = not statistically significant.

Table 2: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Total Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (91)	- .0025		n.s.
	- .0024	.0056 (n.s.)	n.s.
Sub-group			
control (28)	- .0020		n.s.
	- .0025	.0046 (n.s.)	n.s.
problem-solving (21)	- .0067		n.s.
	- .0089	.0111 (n.s.)	n.s.
microteaching (42)	- .0060		n.s.
	- .0057	.0048 (n.s.)	n.s.

n.s. = not statistically significant.

Table 3: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Acceptance Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (91)	- .0032		n.s.
	- .0043	.0093 (.001)	(.002)
Sub-group			
Control (28)	.0044		n.s.
	.0010	.0089 (.032)	n.s.
Problem-solving (21)	- .0028		n.s.
	- .0011	.0063 (n.s.)	n.s.
microteaching (42)	- .0071		n.s.
	- .0082 (.065)	.0114 (.036)	(.033)

( ) = p value of significant results.
n.s. = not statistically significant.

Table 4: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Acceptance Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (91)	- .0026		n.s.
	- .0025	.0051 (n.s.)	n.s.
Sub-group			
control (28)	- .0038		n.s.
	- .0044	.0058 (n.s.)	n.s.
problem-solving (21)	- .0089		n.s.
	- .0113 (.0711)	.0120 (.044)	n.s.
microteaching (42)	- .0057		n.s.
	- .0056	.0023 (n.s.)	n.s.

( ) = p value of significant results
n.s. = not statistically significant.

Table 5: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Remedial Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (91)	- .0068		n.s.
	- .0078	.0089 (.031)	(.04)
Sub-group			
control (28)	.0118		n.s.
	- .0154	.0054 n.s.	n.s.
problem-solving (21)	- .0034		n.s.
	- .0014	.0074 n.s.	n.s.
microteaching (42)	- .0052		n.s.
	- .0063	.0113 n.s.	n.s.

(   ) = p value of significant results.
n.s.   = not statistically significant.

Table 6: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Remedial Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (91)	- .0071		n.s.
	- .0071	.0014 (n.s.)	n.s.
Sub-group			
control (28)	- .0097	-.0152 (n.s.)	n.s.
	- .0044	.0058 (n.s.)	n.s.
problem-solving (21)	- .0036		n.s.
	- .0026	.0048 (n.s.)	n.s.
microteaching (42)	- .0063		n.s.
	- .0057	.0100 (n.s.)	n.s.

n.s. = not statistically significant.

Table 7: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (91)	- .0031		n.s.
	- .0039	.0070 (.012)	(.028)
Sub-group			
control (28)	.0047		n.s.
	.0033	.0036 n.s.	n.s.
problem-solving (21)	- .0003		n.s.
	.0029	.0119 n.s.	n.s.
microteaching (42)	- .0076		n.s.
	- .0087	.0108 n.s.	(.045)

( ) = p value of significant results.
n.s. = not statistically significant.

Table 8: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (91)	- .0016		n.s.
	- .0016	.0027 (n.s.)	n.s.
Sub-group			
control (28)	.0005		n.s.
	.0003	.0036 (n.s.)	n.s.
problem-solving (21)	.0120		n.s.
	- .0140	.0095 (n.s.)	n.s.
microteaching (42)	- .0079		n.s.
	- .0079	-.0008 (n.s.)	n.s.

n.s. = not statistically significant.

Table 9: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Acceptance Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (91)	- .0056		n.s.
	- .0069	.0116 (.001)	(.003)
Sub-group			
control (28)	.0040		n.s.
	.0007	.0089 (.035)	n.s.
problem-solving (21)	- .0033		n.s.
	- .0003	.0110 n.s.	n.s.
microteaching (42)	- .0109		n.s.
	- .0125	.0174 (.040)	(.037)

( ) = p value of significant results.
n.s. = not statistically significant.

Table 10: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Acceptance Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (91)	- .0012		n.s.
	- .0011	.0014 (n.s.)	n.s.
Sub-group			
control (28)	.0012		n.s.
	.0006	.0045 (n.s.)	n.s.
problem-solving (21)	.0140		n.s.
	- .0160	.0097 (n.s.)	n.s.
microteaching (42)	- .0081		n.s.
	- .0084	-.0047 (n.s.)	n.s.

n.s. = not statistically significant.

Table 11: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Remediation Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (90)	- .0035		n.s.
	- .0043	.0082 n.s.	n.s.
Sub-group			
control (28)	.0060		n.s.
	.0024	.0096 n.s.	n.s.
problem-solving (20)	.0010		n.s.
	.0056	.0088 n.s.	n.s.
microteaching (42)	- .0092		n.s.
	- .0097	.0053 n.s.	n.s.

n.s. = not statistically significant.

Table 12: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Intellectual Remediation Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (90)	- .0038		n.s.
	- .0040	-.0070 (n.s.)	n.s.
Sub-group			
control (28)	- .0021		n.s.
	.0031	-.0205 (.045)	n.s.
problem-solving (20)	.0006		n.s.
	.0015	.0039 (n.s.)	n.s.
microteaching (42)	- .0066		n.s.
	- .0065	.0014 (n.s.)	n.s.

( ) = p value of significant results
n.s. = not statistically significant.

Table 13: Regression Coefficients Relating the Number of Boys Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Conduct Interactions

Analysis for Boys	B Number of Boys	B Number of Call Outs By Boys	Significance of Model
Pooled within (71)	- .0029		n.s.
	- .0036	.0052 n.s.	n.s.
Sub-group			
control (26)	- .0054		n.s.
	- .0045	.0020 n.s.	n.s.
problem-solving (15)	.0036		n.s.
	.0041	.0100 n.s.	n.s.
microteaching (30)	- .0032		n.s.
	- .0022	.0429 n.s.	n.s.

n.s. = not statistically significant.

Table 14: Regression Coefficients Relating the Number of Girls Present in a Class and the Frequency with which They Call Out to their Coefficient of Distribution for Conduct Interactions

Analysis for Girls	B Number of Girls	B Number of Call Outs By Girls	Significance of Model
Pooled within (71)	- .0077		n.s.
	- .0058	.0244 (.035)	n.s.
Sub-group			
control (26)	.0223		n.s.
	- .0225	.0068 (n.s.)	n.s.
problem-solving (15)	- .0079		n.s.
	- .0043	.0187 (n.s.)	n.s.
microteaching (30)	- .0099		n.s.
	- .0170	.0471 (n.s.)	(.027)

( ) = p value of significant results
n.s. = not statistically significant.